

## **INDICATOR 61**

# **DATA REPORT**

**Scope, Frequency and Statistical Reliability  
of Forest Inventories, Assessments, Monitoring,  
and Other Relevant Information**

*Overview and compilation by  
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## OVERVIEW

The 2003 National Report on Sustainable Forests was designed to provide Americans with information on the Nation's progress toward sustainable forest management. It is intended to provide information on the public's ecological, social, and economic concerns regarding forests. This information, however, has never been available in one document, and it is hoped that citizen and government use of this report will improve the quality of the national debate and highlight the need for the organized collection of current, reliable data.

The concept of criteria and indicators generally has been accepted as an appropriate framework for evaluating the status, condition, trends, and prospects for the Nation's forests based on measures of biodiversity, productivity, health, carbon dynamics, and socioeconomic aspects. The first requirement of such an evaluation is a basic set of data for the indicators. The second requirement is knowledge of the currency and reliability of the data. The purpose of this summary is to profile the adequacy of data for each of the indicators.

There are seven criteria and 67 indicators. The indicators of criteria 1-6 address biological diversity, the productive capacity of the forest, the health of the ecosystem, soil and water resources, global carbon cycles, and the social and economic benefits that come from the forests. The indicators of criterion 7 address the legal, institutional, and economic framework for supporting forest conservation and sustainable management.

To the extent possible, published and peer reviewed data were used in the preparation of these reports. Data for the indicators range from full current coverage to one-time studies, to anecdotal information. By looking at a cross section of the information in three broad categories – coverage, currency, and frequency – a brief overview of the situation for each indicator can be evaluated.

Although information is available for most of the indicators, few indicators have a full range of data that is current, national in scope, and collected frequently. And, there is no system for maintaining current information across broad suites of indicators in an organized manner. The most striking pattern in the summary is the lack of adequate data for many indicators. There is, however, at least anecdotal data for most of the indicators providing a core knowledge base from which to build in most cases. Therefore, program infrastructures may be in place that simply has to be mandated and funded to collect and report the needed information.

The most reliable data are found in criterion 2, which has data supplied mainly by the Forest Service Forest Inventory and Analysis (FIA) program, which has been collecting basic statistics on the Nation's forests for over 70 years. In general, criteria 1 through 5, representing physical measures of ecosystems, have the best information with the greatest deficiency being frequency of data collection. The deficiencies in criteria 6 and 7 tend toward a lack of current data and poor frequency of data collection. Overall, an organized approach at the national scale is lacking for repeated collection of quality data to underpin critical trend analysis. Thus, constructing a coherent picture of the sustainability of the Nation's forest resources is difficult owing to the inadequacy of much of the data.

A chart summarizing coverage, currency, and frequency for all indicators is followed by a more detailed summary for each indicator including published and unpublished references.

## Indicator Data Status Summary

### Indicator 61- Scope, frequency, and statistical reliability of forest inventories, assessments, monitoring and other relevant information

#### What is the indicator and why is it important

Public discussion and decisions related to natural resource sustainability issues should be based on comprehensive, current and sound data. Information regarding the frequency, coverage, and reliability of data provides analysts with critical information for evaluating and prioritizing sustainability needs.

#### What the data shows

Data for the 67 indicators range from full current coverage to one-time studies, to very anecdotal information. By looking at a cross section of the information in three broad categories a brief overview of the situation for each Criterion can be seen. Few indicators have a full suite of data that is current, national in scope, and collected frequently. The most persistent gap is the lack of systematic national data collection for many indicators. Given the numerous gaps, all data presented are considered reliable as the best data currently available. The following table summarizes the status of each indicator.

KEY			
<b>Notes on the rating system:</b> <i>This rating provides a general overview of the data supporting the indicators. Green means few gaps, yellow means several gaps, red means no data or numerous gaps, and purple indicates data that has been modelled.</i>		<b>Data coverage</b>	<b>Data currency</b>
			<b>Data frequency</b>
	Data generally complete nationally, current, and reliable.	National	1997+
	Data may not be complete and consistent nationally, slightly dated, or not measured frequently enough.	Regional or some	1980-96
	Data are from inconsistent sources or non-existent, more than 15 years old, or have no consistent plan for remeasurement.	Varies or incomplete	Incomplete
	Data are modelled [currency and frequency dots refer to model baseline data]	Modelled	One-time or incomplete

Criterion	Indicators	Data status		
		Coverage	Currency	Frequency
1 Conservation of biodiversity	1 Area of total land and forest land by type			
	2 Area of forest by type and age			
	3 Area of forest by type and IUCN category			
	4 Area of forest by type, age, and IUCN			
	5 Fragmentation by forest type			
	6 Number of forest-dependent species			
	7 Status of forest-dependent species			
	8 Number of forest-dependent species in restricted range			
	9 Population levels of representative species			
2 Maintenance of productive capacity of forest ecosystems	10 Area of forest land & timberland available for timber production			
	11 All live and growing stock volume			
	12 Area and growing stock in plantations			
	13 Annual removals for products vs. sustainable volume			
	14 Removals of nontimber products vs. sustainable levels			
3 Maintenance of forest ecosystem health and vitality	15 Area and percent forest damaged by insect, disease, fire, flood, etc			
	16 Area and percent forest affected by airborne agents [nitrate, ozone, etc]			
	17 Area and percent forest with diminished biological components			
4 Conservation and maintenance of soil and water resources	18 Area and percent of forest with significant soil erosion			
	19 Area and percent of forest managed primarily for protective functions			
	20 Percent of stream kilometers in forested catchments			
	21 Area and percent of forest with significantly diminished soil organic matter			
	22 Area and percent of forest with significant soil compaction			
	23 Percent of water bodies in forested areas with sig. change in biodiversity			
	24 Pct of water bodies in forested areas with sig. change in hydro. character			
	25 Area and pct of forest area experiencing sig. accum. of toxic substances			

<i>Criteria &amp; Indicators (continued)</i>		Data status		
Criterion	Indicators	Coverage	Currency	Frequency
6 Maintenance and enhancement of long-term multiple socio-economic benefits to meet the needs of societies	29 Value and volume of wood products (including value added)			
	30 Value and quantity of non-wood forest products			
	31 Supply and consumption of wood/wood products (including per capita)			
	32 Value of wood and nonwood forest products as percent of GDP			
	33 Value of wood and nonwood forest products as percent of GDP			
	34 Supply and consumption/use of non-wood products			
	35 Area and percent forest land managed for recreation (rel to total)			
	36 Number & type of recreation facilities (rel. to forest Area & population)			
	37 Number of recreation visitor days (rel. to forest Area & population)			
	38 Value of investment in forest growth, health, mgmt., recreation, etc.			
	39 Expenditures on research and education			
	40 Extension and use of new and improved technology			
	41 Rates of return on investment			
	42 Area and percent forest managed to protect cultural etc needs			
	43 Non-consumptive forest use values.			
	44 Direct and indirect employment in forest sector (rel. to total)			
	45 Average wage rates and injury rates in forest sector			
	46 Viability and adaptability to change of forest-dependent communities			
	47 Area and percent of forest land used for subsistence purposes			
7 Legal, institutional, and economic framework for forest conservation and sustainable management.	48 Clarifies property rights			
	49 Provides for periodic forest-related planning, assessment, and policy review			
	50 Provides opps for public participation in public policy and decision making			
	51 Encourages best practice codes for forest management			
	52 Provides for the mgmt.t of forests to conserve special environmental values			
	53 Provide for public involvement activities and public education, etc			
	54 Undertake and implement periodic forest-related planning, assessment, etc			
	55 Develop and maintain human resource skills across relevant disciplines			
	56 Develop and maintain efficient physical infrastructure to facilitate the supply of forest products and services			
	57 Enforce laws, regulations and guidelines			
	58 Investment and taxation policies and a regulatory environment which recognizes the long-term nature of investments			
	59 Non-discriminatory trade policies for forest products			
	60 Availability and extent of up-to-date data, statistics, and other information			
	61 Scope, frequency, and statistical reliability of forest inventories, etc			
	62 Compatibility with other countries in meas., monitoring and reporting			
	63 Development of scientific understanding of forest ecosystems			
	64 Development of methodologies to measure and integrate environmental and social costs and benefits into markets and public policies			
	65 New technologies and the capacity to assess socioeconomic consequences			
	66 Enhancement of ability to predict impacts of human intervention on forests			
	67 Ability to predict impacts on forests of possible climate change			

<b>Indicator and Title:</b>	<p><b>Indicator 1</b>– Extent of area by forest type relative to total forest area</p> <p><b>Indicator 2</b>– Extent of area by forest type and by age class or successional stage</p>
<b>Indicator Lead:</b>	W. Brad Smith, USDA Forest Service
<b>Data Coverage:</b>	Nationwide
<b>Data Frequency:</b>	Annual since 1999, historically every 7-10 years by State since 1930
<b>Data Currency:</b>	2002
<b>Data Source:</b>	<p>USDA Forest Service, Research and Development, Forest Inventory and Analysis (FIA) program. FIA is mandated under the Forest and Rangeland Renewable Resources Research Act of 1978 (PL 95-307, as amended), which replaced the McSweeney/McNary Act of 1928, directing the Secretary of Agriculture to collect, analyze, and periodically report information about renewable resources of the Nation's forest, range, and related lands.</p> <p>Forest types are defined by the Society of American Foresters (Eyre 1980) as associations or groups of tree species that are commonly found in forested communities ranging from single species to complex mixtures.</p>
<b>Data Reliability:</b>	FIA field surveys are designed to provide reliable forest area data at +/- 3 percent per million acres of forest area and +/-5 percent per billion cubic feet of volume. Historic estimates prior to FIA field inventories have been developed from FIA trend data on forests and U.S. Bureau of the Census data on forest land cleared for farming since 1850.
<b>References:</b>	<p>Bailey, R. G. 1995. Description of the ecoregions of the United States. Misc. Pub. No. 1391. Washington, DC: U.S. Department of Agriculture, Forest Service. 108 p. + map.</p> <p>Eyre, F.H., ed. 1980. Forest cover types of the United States and Canada. Bethesda, MD: Society of American Foresters. 148 p. + map.</p> <p>Smith, W.B.; Miles, P.L., Vissage, J.S.; Sheffield, R.M. 2003. FIA statistics, 2002 RPA online data, references, and a map of U.S. forest distributions are available at <a href="http://fia.fs.fed.us">http://fia.fs.fed.us</a> [see RPA section]</p> <p>Smith, W.B.; Vissage, J.S.; Darr, D.R.; Sheffield, R.M. 2001. Forest Statistics of the United States, 1997. Gen. Tech. Rep. NC-219. St. Paul, MN: U.S. Department of Agriculture, Forest Service. 191 p.</p>

<b>Indicator and Title:</b>	<b>Indicator 3</b> – Extent of area by forest type in protected area categories as defined by IUCN or other classification system
<b>Indicator Lead:</b>	W. Brad Smith, USDA Forest Service
<b>Data Coverage:</b>	Nationwide
<b>Data Frequency:</b>	Annual since 1999, historically every 7-10 years since 1930.
<b>Data Currency:</b>	2002
<b>Data Source:</b>	<p>USDA Forest Service, Research and Development, Forest Inventory and Analysis (FIA) program. FIA is mandated under the Forest and Rangeland Renewable Resources Research Act of 1978 (PL 95-307, as amended), which replaced the McSweeney/McNary Act of 1928, directing the Secretary of Agriculture to collect, analyze, and periodically report information about renewable resources of the Nation's forest, range, and related lands.</p> <p>Forest types are defined by the Society of American Foresters (Eyre, 1980) as associations or groups of tree species that are commonly found in forested communities ranging from single species to complex mixtures.</p> <p>Protected areas data derived from Conservation Biology Institute database merged with FIA spatial cover type data. IUCN is the World Conservation Monitoring Union founded in 1948 with a mission to influence, encourage and assist societies throughout the world to conserve the integrity and diversity of nature and to ensure that any use of natural resources is equitable and ecologically sustainable. The IUCN protected area classification system has 6 broad categories: 1) strict nature reserve/wilderness, 2) national park, 3) natural monument, 4) habitat/species management area, 5) protected landscape/seascape, and 6) managed resource protection area. More information may be found at <a href="http://www.iucn.org">http://www.iucn.org</a></p>
<b>Data Reliability:</b>	FIA field surveys are designed to provide reliable forest area data at +/- 3 percent per million acres of forest area.
<b>References:</b>	<p>Eyre, F.H., ed. 1980. Forest cover types of the United States and Canada. Bethesda, MD: Society of American Foresters. 148 p. + map.</p> <p>IUCN, World Conservation Union. 1994. 1993 United Nations List of National Parks and Protected Areas. Prepared by WCMC and CNPPA. IUCN, Gland, Switzerland and Cambridge, UK. xlvii + 315 pp.</p> <p>Protected Areas Data Base, Conservation Biology Institute, Corvallis, OR. (<a href="http://www.consbio.org/cbi/what/pad.htm">www.consbio.org/cbi/what/pad.htm</a>) and the Remote Sensing Research Unit, Southern Research Station, Raleigh, NC</p> <p>Smith, W.B.; Miles, P.L.; Vissage, J.S.; Sheffield, R.M. 2003. FIA statistics, 2002 RPA online data, references, and a map of U.S. forest distributions are available at <a href="http://fia.fs.fed.us">http://fia.fs.fed.us</a> [see RPA section]</p> <p>Smith, W.B.; Vissage, J.S.; Darr, D.R.; Sheffield, R.M. 2001. Forest statistics of the United States, 1997. Gen. Tech. Rep. NC-219. St. Paul, MN: U.S. Department of Agriculture; Forest Service. 191 p.</p>

<b>Indicator and Title:</b>	<b>Indicator 4</b> – Extent of areas by forest type in protected areas defined by age class or successional stage
<b>Indicator Lead:</b>	W. Brad Smith, USDA Forest Service
<b>Data Coverage:</b>	Only 30 percent of protected areas currently have age class. Currently available data reported.
<b>Data Frequency:</b>	Annually since 1999, historically every 7-10 years by State since 1930.
<b>Data Currency:</b>	2002
<b>Data Source:</b>	<p>USDA Forest Service, Research and Development, Forest Inventory and Analysis (FIA) program. FIA is mandated under the Forest and Rangeland Renewable Resources Research Act of 1978 (PL 95-307, as amended), which replaced the McSweeney/McNary Act of 1928, directing the Secretary of Agriculture to collect, analyze, and periodically report information about renewable resources of the Nation's forest, range, and related lands.</p> <p>Forest types are defined by the Society of American Foresters (Eyre, 1980) as associations or groups of tree species that are commonly found in forested communities ranging from single species to complex mixtures.</p>
<b>Data Reliability:</b>	FIA field surveys are designed to provide reliable forest area data at +/- 3 percent per million acres of forest area.
<b>References:</b>	<p>Eyre, F.H., ed. 1980. Forest cover types of the United States and Canada. Bethesda, MD: Society of American Foresters. 148 p. 1 map sheet.</p> <p>IUCN, World Conservation Union. 1994. 1993 United Nations List of National Parks and Protected Areas. Prepared by WCMC and CNPPA. IUCN, Gland, Switzerland and Cambridge, UK. xlvii + 315 pp.</p> <p>Protected Areas Data Base, Conservation Biology Institute, Corvallis, OR. (<a href="http://www.consbio.org/cbi/what/pad.htm">www.consbio.org/cbi/what/pad.htm</a>) and the Remote Sensing Research Unit, Southern Research Station, Raleigh, NC</p> <p>Smith, W.B.; Miles, P.L.; Vissage, J.S.; Sheffield, R.M. 2003. FIA statistics, 2002 RPA online data, references, and a map of U.S. forest distributions are available at <a href="http://fia.fs.fed.us">http://fia.fs.fed.us</a> [see RPA section]</p> <p>Smith, W.B.; Vissage, J.S.; Darr, D.R.; Sheffield, R.M. 2001. Forest statistics of the United States, 1997. Gen. Tech. Rep. NC-219. St. Paul, MN: U.S. Department of Agriculture, Forest Service. 191 p.</p>

<b>Indicator and Title:</b>	<b>Indicator 5</b> – Fragmentation of forest types
<b>Indicator Lead:</b>	Kurt Riitters, USDA Forest Service
<b>Data Coverage:</b>	All forest land in the conterminous 48 States, plus District of Columbia
<b>Data Frequency:</b>	One time
<b>Data Currency:</b>	circa 1992
<b>Data Source:</b>	The Multi-Resolution Landscape Characteristics (MRLC) project and the National Land Cover Database (NLCD) project. Both projects are federal interagency consortia that provide a 21-class land cover map (with four general forest types identified) for the conterminous United States at a spatial resolution of 0.09 ha per pixel.
<b>Data Reliability:</b>	The accuracy of the MRLC/NLCD is known for the Eastern United States and accuracy assessments are underway for the Western United States. In the East, the average accuracy after omission and commission errors for an aggregated single class of forest is approximately 90 percent per pixel.
<b>References:</b>	<p>Riitters, K.H.; Wickham, J.D.; Coulston, J.W. [In press] A preliminary assessment of Montreal Process indicators of forest fragmentation for the United States. Environmental Monitoring and Assessment.</p> <p>Riitters, K.H.; Wickham, J.D.; O’Niell, R.V.; Jones, K.B.; Smith, E.R.; Coulston, J.W.; Wade, T.G.; Smith, J.H. 2002. Fragmentation of continental United States forests. <i>Ecosystems</i> 5: 815-822.</p> <p>Vogelmann J.E.; Sohl, T.; Howard, S.M. 1998. Regional characterization of land cover using multiple sources of data. <i>Photogrammetric Engineering and Remote Sensing</i> 64: 45-57.</p> <p>Vogelmann, J.E.; Howard, S.M.; Yang, L.; Larson, C.R., Wylie, B.K.; Van Driel, N. 2001. Completion of the 1990s national land cover data set for the conterminous United States from Landsat Thematic Mapper data and ancillary data sources. <i>Photogrammetric Engineering and Remote Sensing</i> 67: 650-662.</p> <p>Yang, L; Stehman, S.V.; Smith, J.H.; Wickham, J.D. 2001. Thematic accuracy of MRLC land cover for the eastern United States. <i>Remote Sensing of the Environment</i> 76: 418-422.</p>



<b>Indicator and Title:</b>	<b>Indicator 6 – Number</b> of forest dependent species
<b>Indicator Lead:</b>	Curt Flather, USDA Forest Service
<b>Data Coverage:</b>	(1) BBS- United States and southern Canada; (2) WWF- North America; (3) NatureServe – North America
<b>Data Frequency:</b>	(1) BBS- annually since 1966; (2) WWF- cross-sectional data [no temporal component]; (3) NatureServe- cross-sectional data [no temporal component]
<b>Data Currency:</b>	(1) BBS- 2000; (2) WWF- 1999; (3) NatureServe- 2002
<b>Data Source:</b>	<p>(1) The North American Breeding Bird Survey (BBS) - The survey is operated by the USGS, Biological Resources Division in partnership with the Canadian Wildlife Service. The BBS is based on a continental network of 4,000 roadside routes (of which about 3,000 are surveyed annually). The sampling unit is a 39.4 kilometer (km) route along a secondary road over which 50 three-minute point counts are conducted at 0.8 km intervals. At each point count stop, all birds seen or heard within 0.4 km of the route are recorded. These data can be used to estimate both species richness and relative abundance. Use of these data in support of Indicator 6 focuses on species richness estimates.</p> <p>(2) The World Wildlife Fund (WWF) database on species occurrence- this database provides information on the number of species that occur throughout the United States and within physiographic strata. The data were compiled by collecting published and unpublished range and distributional maps for North American species. Presence of a species in the United States or any ecoregional stratification was determined by the intersection of a species' geographic range with the country or ecoregional boundary. The list of species reflects the expected species pool inhabiting some geographic area of interest.</p> <p>(3) NatureServe- Explorer Version 1.6- This is a national biodiversity database that was developed and maintained by NatureServe – a nonprofit organization that was created, in partnership with The Nature Conservancy, to develop, manage, and distribute data on the occurrence and conservation status of species across the United States, Canada, and Latin America. Data are used to develop lists of forest-associated species.</p>
<b>Data Reliability:</b>	<p>(1) BBS- Reliability varies by species and the geographic scope of the analysis. Reliability is affected by the number of routes a bird was detected on (sample size), the number of individuals detected on a route (abundance), and the error in the estimates (precision). The BBS was designed to estimate population trends of individual species, and regional credibility measures have been assigned (see indicator 9). These measures of reliability do not address the use of these data in estimating species richness. New techniques are being developed that permit the estimation of species richness based on capture-recapture theory. Estimation of species richness is preferable to simple counts of species detected as such counts are known to be biased (not all species present are detected). Regional credibility measures have not been assigned to the richness estimates, but standard errors can be estimated to judge precision.</p> <p>(2) WWF- Reliability (i.e., the accuracy of the assignment of species to ecoregional strata) is unknown.</p> <p>(3) NatureServe- Reliability (i.e., the extent to which all species have been accounted for) is unknown.</p>
<b>References:</b>	<p>NatureServe. 2002. NatureServe Explorer: an online encyclopedia of life. NatureServe Explorer, Version 1.6, (<a href="http://www.natureserve.org/explorer/">http://www.natureserve.org/explorer/</a>).</p>

Peterjohn, B.G. 1994. North American Breeding Bird Survey. *Birding* 26: 386-398.

Ricketts, T. H.; Dinerstein, E.; Olson, D.M.; Loucks, C.J.; Echbaum, W.; DellaSala, D.; Kavanagh, K.; Hedao, P.; Hurley, P.T.; Carney, K.M.; Abell, R.; Walters, S. 1999. Terrestrial ecoregions of North America: a conservation assessment. Washington, DC: Island Press, 485 p.

Robbins, C. S.; Bystrak, D.A.; Geissler P.H. 1986. The Breeding Bird Survey: its first fifteen years, 1965-1979. Resour. Publ. 157. Washington, DC: U.S. Department of Interior, Fish and Wildlife Service.

Sauer, J. R., Hines, J.E.; Fallon, F. 2001. The North American Breeding Bird Survey, Results and Analysis 1966 - 2000. Version 2001.2, Laurel, MD: U.S. Geological Survey, Patuxent Wildlife Research Center, Laurel, MD (<http://www.nbs.gov/bbs/bbs.html>).

<b>Indicator and Title:</b>	<b>Indicator 7</b> – The status (threatened, rare, vulnerable, endangered, or extinct) of forest-dependent species at risk of not maintaining viable breeding populations, as determined by legislation or scientific assessment.
<b>Indicator Lead:</b>	Curt Flather, USDA Forest Service
<b>Data Coverage:</b>	(1) RPAt- United States; (2) WWF- North America ;( 3) NatureServe- North America
<b>Data Frequency:</b>	(1) RPAt- contains data from July 1976 through December 2001; (2) WWF- cross-sectional data [no temporal component]; (3) NatureServe- cross-sectional data [no temporal component]
<b>Data Currency:</b>	(1) RPAt 2001; (2) WWF 1999; (3) NatureServe 2002
<b>Data Source:</b>	<p>(1) Threatened and endangered species trend database (RPAt) to support Renewable Resources Planning Act National Assessments- In July 1976, the U.S. Fish and Wildlife Service initiated publication of technical bulletins that chronicle the changes in the number of species listed as threatened or endangered under the Endangered Species Act of 1973. This database represents a compilation of those published estimates of species formally listed as threatened or endangered by taxonomic category.</p> <p>(2) The World Wildlife Fund (WWF) database on species occurrence- Provides information on the number of species that occur throughout the United States and within physiographic strata. The data were compiled by collecting published and unpublished range and distributional maps for North American species. Presence of a species in the United States or any ecoregional stratification was determined by the intersection of a species' geographic range with the country or ecoregional boundary. The list of species reflects the expected species pool inhabiting some geographic area of interest.</p> <p>(3) NatureServe- Explorer Version 1.6 is a national biodiversity database that was developed and maintained by NatureServe – a nonprofit organization that was created, in partnership with The Nature Conservancy, to develop, manage, and distribute data on the occurrence and conservation status of species across the United States, Canada, and Latin America. Data are used to develop lists of forest-associated species and to assign species to conservation status categories.</p>
<b>Data Reliability:</b>	(1) RPAt- Database is a compilation of published numbers of species listed as threatened of endangered by taxonomic. The database is as reliable as these published sources. (2)WWF- Reliability (i.e., the accuracy of the assignment of species to ecoregional strata) is unknown. (3) NatureServe- Reliability (i.e., the extent to which all species have been accounted for) is unknown.
<b>References:</b>	<p>Flather, C. H.; Brady, S.J.; Knowles, M.S... 1999. Wildlife resource trends in the United States: a technical document supporting the 2000 USDA Forest Service RPA assessment. Gen. Tech. Rep. RMRS-GTR-33. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 79 p.</p> <p>NatureServe. 2002. NatureServe Explorer: an online encyclopedia of life. NatureServe Explorer, Version 1.6, (<a href="http://www.natureserve.org/explorer/">http://www.natureserve.org/explorer/</a>).</p> <p>Ricketts, T. H.; Dinerstein, E.; Olson, D.M.; Loucks, C.J.; Echbaum, W.; DellaSala, D.; Kavanagh, K.; Hedao, P.; Hurley, P.T.; Carney, K.M.; Abell, R.; Walters, S. 1999. Terrestrial ecoregions of North America: a conservation assessment. Washington, DC: Island Press, 485p.</p>

<b>Indicator and Title:</b>	<b>Indicator 8</b> – The number of forest-dependent species that occupy a small portion of their former range.
<b>Indicator Lead:</b>	Curt Flather, USDA Forest Service
<b>Data Coverage:</b>	(1) RRD- United States; (2) NatureServe- North America; (3) BBS- United States and southern Canada
<b>Data Frequency:</b>	(1) RRD- Cross-sectional data (no temporal component); (2) NatureServe- Cross-sectional data (no temporal component); (3) BBS- Annually since 1966
<b>Data Currency:</b>	(1) RRD- 2001; (2) NatureServe- 2002; (3) BBS- 2000
<b>Data Source:</b>	<p>(1) Range reduction database (RRD) for threatened and endangered species. This database was compiled to support the 2003 national report on sustainable forests. The database reflects a compilation of information on the historic and current range of a species that was listed as threatened or endangered under the Endangered Species Act of 1973. Estimates of geographic range and habitat were abstracted from the final listing decisions as published in the Federal Register.</p> <p>(2) NatureServe- Explorer Version 1.6. This is a national biodiversity database that was developed and maintained by NatureServe – a nonprofit organization that was created, in partnership with The Nature Conservancy, to develop, manage, and distribute data on the occurrence and conservation status of species across the United States, Canada, and Latin America.</p> <p>(3) The North American Breeding Bird Survey (BBS) - The survey is operated by the USGS, Biological Resources Division in partnership with the Canadian Wildlife Service. The BBS is based on a continental network of 4,000 roadside routes (of which about 3,000 are surveyed annually). The sampling unit is a 39.4 kilometer (km) route along a secondary road over which 50 three minute point counts are conducted at 0.8 km intervals. At each point count stop, all birds seen or heard within 0.4 km of the route are recorded. This data can be used to estimate both species richness and relative abundance. Use of this data in support of indicator 8 focuses on estimating a species' geographic range.</p>
<b>Data Reliability:</b>	<p>(1) RRD- The reliability of those published range estimates is unknown.</p> <p>(2) NatureServe- Reliability (i.e., the extent to which all species have been accounted for) is unknown.</p> <p>(3) BBS- Reliability varies by species and the geographic scope of the analysis. Reliability is affected by the number of routes a bird was detected on (sample size), the number of individuals detected on a route (abundance), and the error in the estimates (precision). The BBS was designed to estimate population trends of individual species and regional credibility measures of population trends have been assigned (see indicator 9). These measures of reliability do not address the use of these data in the estimation of a species' geographic range.</p>
<b>References:</b>	<p>Flather, C. H.; Sieg, C.H.; Knowles, M.S.; McNees, J. [In prep.] Criterion 1: Conservation of biological diversity. Indicator 8: The number of forest dependent species that occupy a small portion of their former range.</p> <p>NatureServe. 2002. NatureServe Explorer: an online encyclopedia of life. NatureServe Explorer, Version 1.6, (<a href="http://www.natureserve.org/explorer/">http://www.natureserve.org/explorer/</a>).</p> <p>Peterjohn, B.G. 1994. North American Breeding Bird Survey. <i>Birding</i> 26: 386-398.</p>

Robbins, C. S.; Bystrak, D.A.; Geissler P.H. 1986. The Breeding Bird Survey: its first fifteen years, 1965-1979. Resour. Publ. 157. Washington, DC: U.S. Department of Interior, Fish and Wildlife Service.

Sauer, J. R., Hines, J.E.; Fallon, F. 2001. The North American Breeding Bird Survey, Results and Analysis 1966 - 2000. Version 2001.2, Laurel, MD: U.S. Geological Survey, Patuxent Wildlife Research Center, Laurel, MD (<http://www.nbs.gov/bbs/bbs.html>).

<b>Indicator and Title:</b>	<b>Indicator 9</b> – Population levels of representative species from diverse habitats monitored across their range
<b>Indicator Lead:</b>	Carolyn Hull Sieg, USDA Forest Service
<b>Data Coverage:</b>	(1) BBS- United States and southern Canada; (2) FIA- United States; (3) RPAwp- United States
<b>Data Frequency:</b>	(1) BBS- Annually since 1966; (2) FIA- 2002; (3) RPAwp- 5-year intervals from the mid-1970s
<b>Data Currency:</b>	(1) BBS- 2000; (2) FIA- 2002; (3) RPAwp- mid-1990s
<b>Data Source:</b>	<p>(1) The North American Breeding Bird Survey (BBS) - The survey is operated by the USGS, Biological Resources Division in partnership with the Canadian Wildlife Service. The BBS is based on a continental network of 4,000 roadside routes (of which about 3,000 are surveyed annually). The sampling unit is a 39.4 kilometer (km) route along a secondary road over which 50 three-minute point counts are conducted at 0.8 km intervals. At each point count stop, all birds seen or heard within 0.4 km of the route are recorded. These data can be used to estimate both species richness and relative abundance. Use of these data in support of indicator 9 focuses on estimating temporal trends in the abundance of species.</p> <p>(2) USDA Forest Service, Research and Development, Forest Inventory and Analysis (FIA) program- FIA is mandated under the Forest and Rangeland Renewable Resources Research Act of 1978 (PL 95-307, as amended), which replaced the McSweeney/McNary Act of 1928, directing the Secretary of Agriculture to collect, analyze, and periodically report information about renewable resources of the Nation's forest, range, and related lands. Forest types are defined by the Society of American Foresters (Eyre 1980) as associations or groups of tree species that are commonly found in forested communities ranging from single species to complex mixtures.</p> <p>(3) Wildlife population trend database (RPAwp) to support the Renewable Resources Planning Act National Assessment. State wildlife agencies were contacted to provide population estimates of commonly harvested wildlife species. The data represent a state-by-state compilation of population estimates from the mid-1970s through the mid-1990s.</p>
<b>Data Reliability:</b>	<p>(1) BBS- Reliability varies by species and the geographic scope of the analysis. Reliability is affected by the number of routes a bird was detected on (sample size), the number of individuals detected on a route (abundance), and the error in the estimates (precision). Regional credibility measures (low, moderate, and high) have been assigned to population trend estimates to aid in their interpretation. The criteria used to assign a particular trend estimate to a credibility class are as follows:</p> <ul style="list-style-type: none"> <li>• Low credibility: (1) the regional abundance is &lt; 0.1 birds per route (very low abundance); (2) the sample is based on &lt; 5 routes (very small sample size); (3) a 5 percent per year change would not be detected over the long-term (very imprecise).</li> <li>• Moderate credibility: (1) the regional abundance is &lt; 1.0 birds per route (low abundance); (2) the sample is based on &lt; 14 routes (small sample size); (3) a 3 percent per year change would not be detected (imprecise).</li> <li>• High credibility: (1) the regional abundance &gt; 1.0 birds per route (at least moderate abundance); (2) the sample is based on &gt; 14 routes (at least moderate sample size); (3) a 3 percent per year change would be detected (at least moderately precise).</li> </ul> <p>(2) FIA- Field surveys are designed to provide reliable forest area data at +/- 3 percent per million acres of forest area and +/-5 percent per billion cubic feet of volume. Historic estimates prior to FIA field inventories have been developed</p>

from FIA trend data on forests and U.S. Bureau of the Census data on forest land cleared for farming since 1850.

(3) RPAwp- because population estimates of commonly harvested wildlife species were derived from different methods, the overall reliability of trend data is unknown. Individual state agencies would have to be contacted to obtain estimates of uncertainty.

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Smith, W.B.; Miles, P.L.; Vissage, J.S.; Sheffield, R.M. 2003. FIA statistics, 2002 RPA online data, references, and a map of U.S. forest distributions are available at <http://fia.fs.fed.us> [see RPA section]

<b>Indicator and Title:</b>	<p><b>Indicator 10</b> – Area of forest land and net area of forest land available for timber production</p> <p><b>Indicator 11</b>– Total growing stock of both merchantable and non-merchantable tree species on forest land available for timber production</p>
<b>Indicator Lead:</b>	W. Brad Smith, USDA Forest Service
<b>Data Coverage:</b>	Nationwide
<b>Data Frequency:</b>	Annually since 1999, historically every 7-10 years by State since 1930
<b>Data Currency:</b>	2002
<b>Data Source:</b>	USDA Forest Service, Research and Development, Forest Inventory and Analysis (FIA) program. FIA is mandated under the Forest and Rangeland Renewable Resources Research Act of 1978 (PL 95-307, as amended), which replaced the McSweeney/McNary Act of 1928, directing the Secretary of Agriculture to collect, analyze, and periodically report information about renewable resources of the Nation's forest, range, and related lands.
<b>Data Reliability:</b>	FIA field surveys are designed to provide reliable forest area data at +/- 3 percent per million acres of forest area and +/-5 percent per billion cubic feet of volume.
<b>References:</b>	<p>Smith, W.B.; Miles, P.L.; Vissage, J.S.; Sheffield, R.M. 2003. FIA statistics, 2002 RPA online data, references, and a map of U.S. forest distributions are available at <a href="http://fia.fs.fed.us">http://fia.fs.fed.us</a> [see RPA section]</p> <p>Smith, W.B.; Vissage, J.S.; Darr, D.R.; Sheffield, R.M. 2001. Forest statistics of the United States, 1997. Gen. Tech. Rep. NC-219. St. Paul, MN: U.S. Department of Agriculture; Forest Service. 191 p.</p>



<b>Indicator and Title:</b>	<b>Indicator 12</b> – The area and growing stock of plantations of native and exotic species
<b>Indicator Lead:</b>	W. Brad Smith, USDA Forest Service
<b>Data Coverage:</b>	Nationwide
<b>Data Frequency:</b>	Tree planting statistics annually since 1928. Annually since 1999, historically every 7-10 years by State since 1930.
<b>Data Currency:</b>	2002
<b>Data Source:</b>	<p>USDA Forest Service, Research and Development, Forest Inventory and Analysis (FIA) program. FIA is mandated under the Forest and Rangeland Renewable Resources Research Act of 1978 (PL 95-307, as amended), which replaced the McSweeney/McNary Act of 1928, directing the Secretary of Agriculture to collect, analyze, and periodically report information about renewable resources of the Nation's forest, range, and related lands.</p> <p>Tree planting data have been collected by USDA Forest Service State and Private Cooperative Forestry branch since 1928. These data are based on surveys of major nurseries and tree planting data from state and federal agencies.</p>
<b>Data Reliability:</b>	FIA field surveys are designed to provide reliable forest area data at +/- 3 percent per million acres of forest area and +/-5 percent per billion cubic feet of volume.
<b>References:</b>	<p>Smith, W.B.; Miles, P.L.; Vissage, J.S.; Sheffield, R.M. 2003. FIA statistics, 2002 RPA online data, references, and a map of U.S. forest distributions are available at <a href="http://fia.fs.fed.us">http://fia.fs.fed.us</a> [see RPA section]</p> <p>Smith, W.B.; Vissage, J.S.; Darr, D.R.; Sheffield, R.M. 2001. Forest statistics of the United States, 1997. Gen. Tech. Rep. NC-219. St. Paul, MN: U.S. Department of Agriculture; Forest Service. 191 p.</p> <p>U.S. Department of Agriculture, Forest Service. Annual. Tree planting in the United States. Washington, D.C.: U.S. Department of Agriculture, Forest Service, State and Private Cooperative Forestry.</p>

<b>Indicator and Title:</b>	<b>Indicator 13</b> – Annual removal of wood products compared to the volume determined to be sustainable
<b>Indicator Lead:</b>	W. Brad Smith, USDA Forest Service
<b>Data Coverage:</b>	All U.S. forest land
<b>Data Frequency:</b>	Annually since 1999, historically every 7-10 years by State since 1930. Primary wood using mill data from all pulp mills annually since 1947, sawmills every 3-10 years, veneer mills every 4 years, other mills every 3-10 years.
<b>Data Currency:</b>	2002
<b>Data Source:</b>	USDA Forest Service, Research and Development, Forest Inventory and Analysis (FIA) program. FIA is mandated under the Forest and Rangeland Renewable Resources Research Act of 1978 (PL 95-307, as amended), which replaced the McSweeney/McNary Act of 1928, directing the Secretary of Agriculture to collect, analyze, and periodically report information about renewable resources of the Nation's forest, range, and related lands.
<b>Data Reliability:</b>	FIA field surveys are designed to provide reliable forest area data at +/- 3 percent per million acres of forest area and +/-5 percent per billion cubic feet of volume.
<b>References:</b>	<p>Smith, W.B.; Miles, P.L.; Vissage, J.S.; Sheffield, R.M. 2003. FIA statistics, 2002 RPA online data, references, and a map of U.S. forest distributions are available at <a href="http://fia.fs.fed.us">http://fia.fs.fed.us</a> [see RPA section]</p> <p>Smith, W.B.; Vissage, J.S.; Darr, D.R.; Sheffield, R.M. 2001. Forest statistics of the United States, 1997. Gen. Tech. Rep. NC-219. St. Paul, MN: U.S. Department of Agriculture; Forest Service. 191 p.</p> <p>Smith, W. B. 1991. Assessing removals for North Central forest inventories. Res. Pap. NC-299. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station. 48 p.</p>

<b>Indicator and Title:</b>	<b>Indicator 14</b> – Annual removal of non-timber forest products (e.g., fur-bearers, berries, mushrooms, game) compared to the level determined to be sustainable.
<b>Indicator Lead:</b>	Susan Alexander, USDA Forest Service
<b>Data Coverage:</b>	All U.S. forest land
<b>Data Frequency:</b>	Varies, intermittent to annually
<b>Data Currency:</b>	2002
<b>Data Source:</b>	Game animals, fur bearers- State and Federal wildlife agencies. Medicinals, Food and forage species, floral and horticultural species, resins and oils, arts and crafts-market reports, USDC Bureau of the Census export data (US Harmonized Tariff Code System), U.S. Department of Agriculture, Forest Service and U.S. Department of Interior, Bureau of Land Management permit data, local and regional surveys. Secondary wood products: USDA Forest Service and USDI Bureau of Land Management permit data, USDC Bureau of Census data, and USDC Bureau of Economic Analysis data.
<b>Data Reliability:</b>	Varies by product category, no standardized system
<b>References:</b>	<p>U.S. Department of Commerce, Bureau of the Census. 2002. Statistics of U.S. businesses 1992, 1997, 1998, 1999. Web site: <a href="http://www.census.gov/">http://www.census.gov/</a></p> <p>U.S. Department of Commerce, Bureau of Economic Analysis. 2002. Web site: <a href="http://www.bea.doc.gov/">http://www.bea.doc.gov/</a></p>

**Indicator and Title:** **Indicator 15** – Area and percent of forest affected by processes or agents beyond the range of historic variation, e.g. by insects, disease, competition from exotic species, fire, storm, land clearance, permanent flooding, salinization and domestic animals.

**Indicator Lead:** Andy Mason, USDA Forest Service

**Data Coverage:** Nationwide

**Data Frequency:** Climate – Largely anecdotal records of climatic events going back to 1200-1300  
 Fire - Annual from 1960 to present, decadal 1919-60  
 Insects and Diseases – Annual from 1979 to present for most data.  
 Anecdotal records in some cases back to the early 1800s.  
 Dendrochronological information for some insects to 1630.  
 Invasive Plants – Anecdotal records going back to the 1800s  
 Forest Area – RPA data from the 1997 assessment for forest area were used

**Data Currency:** 2000

**Data Sources**

Climate – Climatic data was taken from a variety of sources including the 2001 assessment of Working Group I of the Intergovernmental Panel on Climate Change, (IPCC), the National Oceanic and Atmospheric Administration (NOAA), and the National Interagency Fire Center (NIFC) in Boise, Idaho. Some instrumental records of temperature and drought dating back to 1861 and 1895, respectively, were included. Information on specific storm events between 1938 and 2000, which caused severe forest damage, was taken from individual reports describing these events.

Fire – Data on changes in historic fire regimes was provided by the Fire Sciences Laboratory, Rocky Mountain Research Station in Missoula, MT. Statistical data on wildfire occurrence were accessed from a database maintained by NIFC. Annual statistics on the number of fires and area burned are available from 1960 to the present and on a decadal basis from 1919 to the present.

Insects And Diseases – Information on the status of insect and disease outbreaks was taken from early historical reports and annual national conditions reports published by the USDA Forest Service. Formal aerial and ground surveys to map the status of insect damage in U.S. forests began in some regions as early as 1947. Beginning in 1951, the National Office of the Forest Service began to issue annual insect conditions reports. These reports were brief, narrative descriptions of the regional status of certain insect pests and contained relatively little metric information. In 1971, forest disease conditions were added to the report. Beginning in 1977, some maps, graphics, and statistical data appeared in the reports. In 1979, the format was revised significantly and metric data on a statewide basis for a number of key insects and diseases became a regular feature of the report. Reports from 1979 to the present were used to establish a new reference condition for insects and diseases. An aerial survey database, recently developed by USDA Forest Service, Forest Health Technology Enterprise Team (FHTET) and contain data from 1996-2000, also was used.

Invasive Plants – Databases maintained by USDA and selected literature was used to compile information on the status of invasive plants in forest ecosystems. Anecdotal records are included in the introduction of some invasive plants that date back to the early 1800s.

Forest area - Area of forest land, by forest type groups, used in this analysis is based on data from the 2000 Resources Planning Act (RPA) assessment and accompanying FIA data ([http://fia.fs.fed.us/library/final\\_rpa\\_tables.pdf](http://fia.fs.fed.us/library/final_rpa_tables.pdf)). Wherever possible, data were summarized by RPA regions.

**Data Reliability:**

Recent quantitative data are considered reliable although no statistical errors are estimated owing to the manner in which the data are collected. Anecdotal records, especially those from the 1800s and early 1900s, are of varying reliability.

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<b>Indicator and Title:</b>	<b>Indicator 16</b> – Area and percent forest land subject to specific levels of air pollutants (e.g., sulfates, nitrates, ozone) or ultraviolet B that may cause negative impacts on the forest ecosystem
<b>Indicator Lead:</b>	John Coulston, USDA Forest Service
<b>Data Coverage:</b>	<ul style="list-style-type: none"> <li>(1) NADP/NTN: Wet deposition data for coterminous United States used.</li> <li>(2) EPA AIRS Database: Ambient O3 data for coterminous United States used. Most data from urban or suburban areas.</li> <li>(3) USDA Forest Service Ozone Biomonitoring: Plant injury from O3; monitoring program implemented in 33 states as of 2000.</li> <li>(4) U.S. forest types and predicted percent of forest cover from AVHRR data</li> </ul>
<b>Data Frequency:</b>	<ul style="list-style-type: none"> <li>(1) NADP/NTN: Data available daily 1978-2000 with variable spatial coverage. However, pre-1994 data not directly comparable with post-1994 data.</li> <li>(2) EPA AIRS: Data available hourly with variable spatial coverage from 1994 to 2000.</li> <li>(3) USDA Forest Service ozone biomonitoring: Data available yearly 1994 to 2000 with variable spatial coverage.</li> <li>(4) U.S. forest types and predicted percent forest cover from AVHRR data: One time</li> </ul>
<b>Data Currency:</b>	<p>2000: NADP/NTN; EPA AIRS; USDA Forest Service ozone biomonitoring data.</p> <p>2000: Forest types of the United States</p>
<b>Data Source:</b>	<ul style="list-style-type: none"> <li>(1) NADP/NTN: Available online at <a href="http://nadp.swsuiuc.edu">http://nadp.swsuiuc.edu</a></li> <li>(2) EPA AIRS: Available online at <a href="http://www.epa.gov/airs/airs.html">http://www.epa.gov/airs/airs.html</a></li> <li>(3) USDA Forest Service Ozone Biomonitoring: Available online at <a href="http://fhmozone.net">http://fhmozone.net</a></li> <li>(4) U.S. forest types: Available online at <a href="http://nationalatlas.gov">http://nationalatlas.gov</a></li> </ul>
<b>Data Reliability:</b>	<ul style="list-style-type: none"> <li>(1) NADP/NTN: For inclusion of data in annual summaries the following criteria must be met: <ul style="list-style-type: none"> <li>a. There must be valid samples (as defined in Section III.A) for at least 75 percent of the summary period.</li> <li>b. For at least 90 percent of the summary period there must be precipitation amounts (including zero amounts) either from the rain gage or from the sample volume.</li> <li>c. There must be valid samples (as defined in Section III.A) for at least 75 percent of the total precipitation amount reported for the summary period.</li> <li>d. For the entire summary period the total precipitation as measured from the sample volume must be at least 75 percent of the total precipitation measured by the rain gage for all valid samples where both values are available.</li> </ul> </li> <li>(2) EPA AIRS: The EPA states that they make diligent efforts to ensure the accuracy of these data. However, some data is incomplete. Summaries using the raw hourly data were based on an average capture rate of 95 percent.</li> <li>(3) USDA Forest Service Ozone Biomonitoring: At each biomonitoring site, the amount and severity of ozone injury is recorded in 5 classes each. The</li> </ul>

measurement quality objective is 90 percent of observation with one class when compared to quality assurance crew.

- (4) U.S. forest types: Metadata states no test for logical consistency has been performed on this data set.

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<b>Indicator and Title:</b>	<b>Indicator 17</b> – Area and percentage of forest land with diminished biological components indicative of changes in fundamental ecological processes and/or ecological continuity.
<b>Indicator Lead:</b>	Mark Ambrose, USDA Forest Service
<b>Data Coverage:</b>	All U.S. forest land in states in which FHM (FIA, P3) plots has been established (32 states as of 1999). Permanent fixed-area plots were located approximately 27 kilometers (km) apart on a hexagonal grid (EPA EMAP grid). Each plot represented 158,000 acres. In 2000, the grid was intensified so that each plot represented 94,800 acres.
<b>Data Frequency:</b>	Currently one-fifth of the P3 plots are measured every year according to a rotating panel design (5-year cycle). Prior to 2000, one-third of the plots were measured every year on a 4-year cycle. Earliest data are from 1990 for the New England states.
<b>Data Currency:</b>	Data through 1999 used for this report; 2000, 2001 data is currently being processed.
<b>Data Source:</b>	<p>USDA Forest Service, Forest Health Monitoring (FHM) program. FHM collected forest health plot data from 1990 through 1999.</p> <p>USDA Forest Service, Research and Development, Forest Inventory and Analysis (FIA) program. <a href="http://fia.fs.fed.us">http://fia.fs.fed.us</a></p> <p>Fire Science Laboratory. 2001. Current condition classes, 2000. Missoula, MT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Science Laboratory. <a href="http://www.fs.fed.us/fire/fuelman/curcond.htm">http://www.fs.fed.us/fire/fuelman/curcond.htm</a>.</p> <p>Fire Science Laboratory. 2001. Historical natural fire regimes, 2000. Missoula, MT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Science Laboratory. <a href="http://www.fs.fed.us/fire/fuelman/firereg.htm">http://www.fs.fed.us/fire/fuelman/firereg.htm</a>.</p>
<b>Data Reliability:</b>	<p>The sampling system was designed to detect large-scale phenomena. Plot intensity allows analysis at the level of approximately 2 million forested acres. This is generally a scale which allows analysis by ecoregion section.</p> <p>Measurement quality objectives (MQOs) are set for each variable measured. (Ex. Crown dieback ratings should agree with QA crew ratings within 10 percentage points 90% of the time; DBH should agree with QA crew measurements within 5% of true DBH 90 percent of the time.) MQOs for other variables can be found in the Field Methods Guides cited below.</p>
<b>References:</b>	<p>The best documentation of the elements of the data sets is provided by the FHM and FIA field methods guides. Because some field protocols have evolved over time, it may be useful to consult the editions of the field methods guides specific to the years of data being analyzed. Citations for the guides corresponding to the most recent data are given below.</p> <p>U.S. Department of Agriculture, Forest Service. November 1999. Course-scale spatial data for wildland fire and fuel management. Ft Collins, CO: Prescribed Fire and Fire Effects Research Work Unit, Rocky Mountain Research Station. Available: <a href="http://www.fs.fed.us/fire/fuelman">http://www.fs.fed.us/fire/fuelman</a></p> <p>FHM downloadable data, data summaries, documentation, and publications are available at <a href="http://www.na.fs.fed.us/spfo/fhm/">http://www.na.fs.fed.us/spfo/fhm/</a>.</p>

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<b>Indicator and Title:</b>	<b>Indicator 18</b> – Area and percent of forestland with significant soil erosion
<b>Indicator Lead:</b>	Kathy O'Neill, USDA Forest Service
<b>Data Coverage:</b>	Soils data nationwide. FIA P3 data currently implemented on 70 percent of all U.S. forest land.
<b>Data Frequency:</b>	Varies by state. FIA P3 data collected on 20 percent of all field plots are measured annually since 1989 (as each State is implemented in annualized FIA inventory).
<b>Data Currency:</b>	<p>STATSGO publication date 1994; dates for individual soil surveys vary. Information available from the NRCS. Soil maps for the State Soil Geographic (STATSGO) database were made by generalizing the detailed soil survey data. The mapping scale for STATSGO map is 1:250,000 (with the exception of Alaska, which is 1:1,000,000). The level of mapping is designed to be used for broad planning and management uses covering state, regional, and multi-state areas.</p> <p>FIA Phase 3 data were collected from 1998 to 2000.</p>
<b>Data Source:</b>	USDA Natural Resource Conservations Service (NRCS, formerly Soil Conservation Service), National Cooperative Soil Survey, State Soil Geographic Database (STATSGO). The NRCS is responsible for collecting, storing, maintaining, and distributing soil survey information for privately owned lands in the United States. USDA Forest Service Forest Health Monitoring (FHM) Program. FHM is a national program designed to determine the status, changes, and trends in indicators of forest condition on an annual basis. The program is coordinated by the USDA Forest Service Research and State and Private Forestry (S&PF).
<b>Data Reliability:</b>	Adherence to National Cooperative Soil Survey standards and procedures is based on peer review, quality control, and quality assurance. Quality control is outlined in documents that reside with the Natural Resources Conservation Service state soil scientist.
<b>References:</b>	<p>U.S. Department of Agriculture, Soil Conservation Service. 1975. Soil Taxonomy: a basic system of soil classification for making and interpreting soil surveys. Agric. Handb. 436. Washington, DC.</p> <p>U.S. Department of Agriculture, Soil Conservation Service. 1992. Keys to Soil Taxonomy. SMSS Technical Monograph No. 19. Soil Survey Staff, Washington, DC.</p> <p>U.S. Department of Agriculture, Soil Conservation Service. 1993. National Soil Survey Handbook, title 430-VI. Soil Survey Staff, Washington, DC.</p> <p>U.S. Department of Agriculture, Soil Conservation Service. 1993. Soil Survey Manual. Agric. Handbook 18. Soil Survey Staff, Washington, DC.</p> <p>U.S. Department of Agriculture, Soil Conservation Service. 1993. National Soil Survey Handbook, title 430-VI. Soil Survey Staff, Washington, DC.</p> <p>U.S. Department of Agriculture, Soil Conservation Service. 1994. State Soil Geographic (STATSGO) Data Base: Data use information. Soil Survey Staff, Washington, DC</p> <p>U.S. Department of Agriculture. State Soil Survey Database Data Dictionary. Soil Conserv. Serv.</p> <p>STATSGO statistics, online databases, metadata, and references are available at <a href="http://www.ftw.nrcs.usda.gov/stat_data.html">http://www.ftw.nrcs.usda.gov/stat_data.html</a>.</p>

FIA statistics, online databases, references, and a map of U.S. forest distributions are available at <http://fia.fs.fed.us>

Forest Health Monitoring Indicator data available at  
<http://www.na.fs.fed.us/spfo/fhm/>

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<b>Indicator and Title:</b>	<b>Indicator 20 – Percent</b> of stream kilometers in forested catchments in which stream flow and timing have deviated significantly from the historic range of variability
<b>Indicator Lead:</b>	David C. Chojnacky, USDA Forest Service
<b>Data Coverage:</b>	Nationwide
<b>Data Frequency:</b>	Daily, but numbers of gauging stations vary over time; some data since 1870
<b>Data Currency:</b>	1999
<b>Data Source:</b>	U.S. Geological Society’s NWISWeb database ( <a href="http://waterdata.usgs.gov/nwis">http://waterdata.usgs.gov/nwis</a> ). Although nationwide data were obtained through a private company ( <a href="http://www.hydrosphere.com">http://www.hydrosphere.com</a> ) for the lowest reach or most downstream gauging station for 1,960 HUC-8 watersheds. Data included 20,243,678 daily maximum water flow measurements.
<b>Data Reliability:</b>	Recent data are collected electronically and periodically reviewed to ensure accuracy. I found few obvious problems. I was initially alarmed by “negative” water flows but found that these are valid measurement for some canals that can flow both ways. Wintertime “zero flow rates” for frozen streams can be tricky to use but these were valid measurements. A few observations included misplaced bracket symbols, which corrupted these measurements. Otherwise, the 20+ million measurements processed flawlessly. ( <a href="http://wa.water.usgs.gov/realtime/data disclaimer.html">http://wa.water.usgs.gov/realtime/data disclaimer.html</a> ).
<b>References:</b>	( <a href="http://waterdata.usgs.gov/nwis">http://waterdata.usgs.gov/nwis</a> ) ( <a href="http://www.hydrosphere.com">http://www.hydrosphere.com</a> ) ( <a href="http://wa.water.usgs.gov/realtime/data disclaimer.html">http://wa.water.usgs.gov/realtime/data disclaimer.html</a> )

<b>Indicator and Title:</b>	<p><b>Indicator 21</b> – Area and percent of forestland with significantly diminished soil organic matter and/or changes in other soil chemical properties</p> <p><b>Indicator 22</b> – Area and percent of forest land with significant compaction or change in soil physical properties resulting from human activities</p>
<b>Indicator Lead:</b>	Kathy O'Neill, USDA Forest Service
<b>Data Coverage:</b>	Soils data nationwide. FIA P3 data currently implemented on 70 percent of all U.S. forest land.
<b>Data Frequency:</b>	Varies by state. FIA P3 data collected on 20 percent of all field plots are measured annually since 1989 (as each State is implemented in annualized FIA inventory).
<b>Data Currency:</b>	<p>STATSGO publication date 1994; dates for individual soil surveys vary. Information available from the NRCS. Soil maps for the State Soil Geographic (STATSGO) database were made by generalizing the detailed soil survey data. The mapping scale for STATSGO map is 1:250,000 (with the exception of Alaska, which is 1:1,000,000). The level of mapping is designed to be used for broad planning and management uses covering state, regional, and multi-state areas.</p> <p>FIA Phase 3 data were collected from 1998 to 2000.</p>
<b>Data Source:</b>	<p>USDA Natural Resource Conservations Service (NRCS, formerly Soil Conservation Service), National Cooperative Soil Survey, State Soil Geographic Database (STATSGO). The NRCS is responsible for collecting, storing, maintaining, and distributing soil survey information for privately owned lands in the United States. USDA Forest Service Forest Health Monitoring (FHM) Program. FHM is a national program designed to determine the status, changes, and trends in indicators of forest condition on an annual basis. The program is coordinated by the USDA Forest Service Research and State and Private Forestry (S&amp;PF).</p>
<b>Data Reliability:</b>	Adherence to National Cooperative Soil Survey standards and procedures is based on peer review, quality control, and quality assurance. Quality control is outlined in documents that reside with the Natural Resources Conservation Service state soil scientist.
<b>References:</b>	<p>U.S. Department of Agriculture, Soil Conservation Service. 1975. Soil Taxonomy: a basic system of soil classification for making and interpreting soil surveys. Agric. Handb. 436. Washington, DC.</p> <p>U.S. Department of Agriculture, Soil Conservation Service. 1992. Keys to Soil Taxonomy. SMSS Technical Monograph No. 19. Soil Survey Staff, Washington, DC.</p> <p>U.S. Department of Agriculture, Soil Conservation Service. 1993. National Soil Survey Handbook, title 430-VI. Soil Survey Staff, Washington, DC.</p> <p>U.S. Department of Agriculture, Soil Conservation Service. 1993. Soil Survey Manual. Agric. Handbook 18. Soil Survey Staff, Washington, DC.</p> <p>U.S. Department of Agriculture, Soil Conservation Service. 1993. National Soil Survey Handbook, title 430-VI. Soil Survey Staff, Washington, DC.</p> <p>U.S. Department of Agriculture, Soil Conservation Service. 1994. State Soil Geographic (STATSGO) Data Base: Data use information. Soil Survey Staff, Washington, DC</p>

U.S. Department of Agriculture. State Soil Survey Database Data Dictionary.  
Soil Conserv. Serv.  
STATSGO statistics, online databases, metadata, and references are available at  
[http://www.ftw.nrcs.usda.gov/stat\\_data.html](http://www.ftw.nrcs.usda.gov/stat_data.html).

FIA statistics, online databases, references, and a map of U.S. forest  
distributions are available at <http://fia.fs.fed.us>

Forest Health Monitoring Indicator data available at  
<http://www.na.fs.fed.us/spfo/fhm/>

<b>Indicator and Title:</b>	<b>Indicator 24</b> – Percent of surface water in forest areas with significant variation from historic range for dissolved oxygen, temperature, electrical conductivity, acidity (pH), and sedimentation.
<b>Indicator Lead:</b>	David C. Chojnacky, USDA Forest Service
<b>Data Coverage:</b>	Over 50 select watershed nationwide
<b>Data Frequency:</b>	Monthly from 1991 to 2000
<b>Data Currency:</b>	2000
<b>Data Source:</b>	U.S. Geological Society's National Water-Quality Assessment (NAWQA) data warehouse.
<b>Data Reliability:</b>	As a general about 10 percent of total budget is spent on quality assurance/control replicate samples and for checking missing data and spikes. I found no obvious problems once data were properly downloaded. Breaking downloading into several files corrected the format error problems.
<b>References:</b>	<a href="http://water.usgs.gov/nawqa/nawqa_home.html">http://water.usgs.gov/nawqa/nawqa_home.html</a> <a href="http://water.usgs.gov/nawqa/protocols/doc_list.html">http://water.usgs.gov/nawqa/protocols/doc_list.html</a>



<b>Indicator and Title:</b>	<b>Indicator 25 – Area</b> and percent of forestland experiencing an accumulation of persistent toxic substances
<b>Indicator Lead:</b>	Kathy O'Neill, USDA Forest Service
<b>Data Source:</b>	USDA Natural Resource Conservations Service (formerly Soil Conservation Service), National Cooperative Soil Survey, State Soil Geographic Database (STATSGO). The NRCS is responsible for collecting, storing, maintaining, and distributing soil survey information for privately owned lands in the United States. USDA Forest Service Forest Health Monitoring (FHM) Program. FHM is a national program designed to determine the status, changes, and trends in indicators of forest condition on an annual basis. The program is coordinated by the USDA Forest Service Research and State and Private Forestry (S&PF).
<b>Data Coverage:</b>	Soils data nationwide. FIA Phase 3 data currently implemented on 70% of all U.S. forest land.
<b>Data Frequency:</b>	Varies by state. FIA Phase 3 data collected on 20% of all field plots annual since 1989 as system implemented.
<b>Data Currency:</b>	STATSGO publication date 1994; dates for individual soil surveys vary. Information available from the NRCS. Soil maps for the State Soil Geographic (STATSGO) database were made by generalizing the detailed soil survey data. The mapping scale for STATSGO map is 1:250,000 (with the exception of Alaska, which is 1:1,000,000). The level of mapping is designed to be used for broad planning and management uses covering state, regional, and multi-state areas.  FIA Phase 3 data were collected from 1998-2000.
<b>Data Reliability:</b>	Indicator 25- TRI data reflect releases and other waste management of chemicals, and not exposures of the public to those chemicals. TRI data alone are not sufficient to determine exposure or to calculate potential adverse effects on the environment. TRI data, in conjunction with other information, can be used as a starting point in evaluating exposures that may result from release and other waste management activities, which involve toxic chemicals.
<b>References:</b>	FIA statistics, online databases, references, and a map of U.S. forest distributions are available at <a href="http://fia.fs.fed.us">http://fia.fs.fed.us</a>  Forest Health Monitoring Indicator data available at <a href="http://www.na.fs.fed.us/spfo/fhm/">http://www.na.fs.fed.us/spfo/fhm/</a>  TRI statistics, online databases, references, and metadata are available at <a href="http://www.epa.gov/triexplorer/">http://www.epa.gov/triexplorer/</a> .  U.S. Department of Agriculture, Soil Conservation Service. 1975. Soil Taxonomy: a basic system of soil classification for making and interpreting soil surveys. Agric. Handb. 436. Washington, DC.  U.S. Department of Agriculture, Soil Conservation Service. 1992. Keys to Soil Taxonomy. SMSS Technical Monograph No. 19. Soil Survey Staff, Washington, DC.  U.S. Department of Agriculture, Soil Conservation Service. 1993. National Soil Survey Handbook, title 430-VI. Soil Survey Staff, Washington, DC.  U.S. Department of Agriculture, Soil Conservation Service. 1993. Soil Survey Manual. Agric. Handbook 18. Soil Survey Staff, Washington, DC.

U.S. Department of Agriculture, Soil Conservation Service. 1993. National Soil Survey Handbook, title 430-VI. Soil Survey Staff, Washington, DC.

U.S. Department of Agriculture, Soil Conservation Service. 1994. State Soil Geographic (STATSGO) Data Base: Data use information. Soil Survey Staff, Washington, DC

U.S. Department of Agriculture. State Soil Survey Database Data Dictionary. Soil Conserv. Serv. STATSGO statistics, online databases, metadata, and references are available at [http://www.ftw.nrcs.usda.gov/stat\\_data.html](http://www.ftw.nrcs.usda.gov/stat_data.html).

<b>Indicator and Title:</b>	<b>Indicator 26 – Total</b> forest ecosystem biomass and carbon pool <b>Indicator 27 – Contribution</b> of forest ecosystems to the total global carbon budget, including absorption and release of carbon
<b>Indicator Lead:</b>	Linda Heath, USDA Forest Service
<b>Data Source:</b>	Main source of data is forest inventory data collected by USDA Forest Service, Research and Development, Forest Inventory and Analysis (FIA) program. See indicator 1. Information about data used for mineral soil carbon given below.
<b>Data Coverage:</b>	All U.S. land
<b>Data Frequency:</b>	Database compiled in early 1990s. Soil samples collected annually for various projects and entered into database. This is not a statistically designed survey; rather it is an ongoing inventory to characterize soils that are thought to be relatively unchanging.
<b>Data Currency:</b>	1990s
<b>Data Source:</b>	Mineral soil carbon: Base data are taken from The State Soil Geographic Data Base (STATSGO). STATSGO data are compiled in 1:250,000 quadrangle units, with mapping units corresponding to soil associations. The number of soil polygons per quadrangle map is between 100 and 400. The minimum area mapped is about 1,544 acres. Each soil association is linked to USDA Natural Resources Conservation Service' Soils Interpretations Record attribute database. The database contains soil survey data including soil properties such as percentage of soil carbon, bulk density, and percentage of rock fragments. Where detailed data were not available, soils of like areas were studied and probably classification and extent of soils were determined.
<b>Data Reliability:</b>	These data are useful for understanding the soils resources and for planning at a state or regional or national level. Statistics must be interpreted cautiously when other data such as land use data are overlaid on STATSGO data.
<b>References:</b>	U.S. Department of Agriculture, Soil Conservation Service. 1991. State Soil Geographic Data Base (STATSGO): Data users guide. Misc. Pub. Number 1492. Washington, DC: U.S. Department of Agriculture, Soil Conservation Service. U.S. Government Printing Office.  Information concerning access to the soils database is available at <a href="http://www.ftw.nrcs.usda.gov/stat_data.html">http://www.ftw.nrcs.usda.gov/stat_data.html</a> .

<b>Indicator and Title:</b>	<b>Indicator 28 – Contribution</b> of forest products to the global carbon budget
<b>Indicator Lead:</b>	Linda Heath, USDA Forest Service
<b>Data Coverage:</b>	All timber arriving at U.S. mills, and wood and wood products imported to and exported from the United States.
<b>Data Frequency:</b>	Annually since 1900
<b>Data Currency:</b>	1999
<b>Data Source:</b>	USDA Forest Service, Research and Development, Forest Products Laboratory researchers. The data were compiled from forest industry trade associations and government agencies, in particular U.S. Department of Agriculture and the U.S. Department of Commerce. Base data are collected through annual surveys of manufacturers.
<b>Data Reliability:</b>	Data are collected through surveys of manufacturers and are thought to provide reliable roundwood production and consumption, and product data at +/- 5 percent of total.
<b>References:</b>	Howard, J.L. 2001. U.S. timber production, trade, consumption, and price statistics 1965-1999. Res. Pap. RP-595. Madison, WI: U.S. Department of Agriculture Forest Service, Forest Products Laboratory. 90 p.

<b>Indicator and Title:</b>	<b>Indicator 30</b> – Value and quantities of production of non-wood forest products.
<b>Indicator Lead:</b>	Susan Alexander, USDA Forest Service
<b>Data Coverage:</b>	All U.S. forest land
<b>Data Frequency:</b>	Varies, intermittent to annually
<b>Data Currency:</b>	2002
<b>Data Source:</b>	<p>Game animals, fur bearers- State and Federal wildlife agencies.</p> <p>Medicinals, Food and forage species, floral and horticultural species, resins and oils, arts and crafts- market reports, USDC Bureau of the Census export data (US Harmonized Tariff Code System), U.S. Department of Agriculture, Forest Service and U.S. Department of Interior, Bureau of Land Management permit data, local and regional surveys.</p> <p>Secondary wood products: USDA Forest Service and USDI Bureau of Land Management permit data, USDC Bureau of Census data, and USDC Bureau of Economic Analysis data.</p>
<b>Data Reliability:</b>	Varies by product category, no standardized system
<b>References:</b>	<p>Alexander, S. J.; Weigand, J.F.; Blatner, K.A... 2002. U.S. commerce in nontimber forest products. In: Jones, E.T.; McLain, R.J.; Weigand, J.F., Eds. Nontimber forest products in the United States. Lawrence, KS: University Press of Kansas. 424 p.</p> <p>U.S. Department of Commerce, Bureau of the Census. 2002. Statistics of U.S. businesses 1992, 1997, 1998, 1999. Web site: <a href="http://www.census.gov/">http://www.census.gov/</a></p> <p>U.S. Department of Commerce, Bureau of Economic Analysis. 2002. Web site: <a href="http://www.bea.doc.gov/">http://www.bea.doc.gov/</a></p>

<b>Indicator and Title:</b>	<b>Indicator 31</b> – Supply and consumption of wood and wood products, including consumption per capita
<b>Indicator Lead:</b>	Ken Skog, USDA Forest Service
<b>Data Coverage:</b>	Nationwide
<b>Data Frequency:</b>	Annual wood consumption and trade data
<b>Data Currency:</b>	1999, 2000
<b>Data Source:</b>	Data for this indicator are from the U.S. Forest Service, Forest Products Laboratory reports on U.S. timber production, trade, consumption, and price statistics; U.S. Department of Commerce, Bureau of the Census reports on historical statistics of the United States; and U.S. Department of Energy, Energy Information Administration annual energy review reports.
<b>Data Reliability:</b>	The data on roundwood equivalent of consumption use estimates of the roundwood equivalent of imports and exports assuming the products are made of roundwood in the United States. The estimate of roundwood use may be high to the extent that recovered paper is used for paper production rather than roundwood. Consumption data are generally not available by region and are based on levels of end use in each region – construction, manufacturing, education, and a wide range of general business activities – advertising, packaging, and communications. To provide consumption levels by region would require additional research not currently conducted.
<b>References:</b>	<p>Howard, J.L. 2001. U.S. Timber production, trade, consumption, and price statistics, 1965-1999. FPL-RP-595. Madison, WI: U.S. Department of Agriculture, Forest Service, Forest Products Laboratory. 90p.  <a href="http://www.fpl.fs.fed.us/documnts/FPLrp/fplrp595/fplrp595.htm">http://www.fpl.fs.fed.us/documnts/FPLrp/fplrp595/fplrp595.htm</a></p> <p>U.S. Department of Agriculture, Forest Service. 1988. U.S. Timber production, trade, consumption, and price statistics, 1950-1987. Misc. Pub. 1471. Washington, DC.</p> <p>U.S. Department of Commerce, Bureau of Census. 1975. Historical statistics of the United States: colonial times to 1970; part 1. Washington, DC: U.S. Department of Commerce. 609 p.  <a href="http://www.census.gov/mp/www/pub/gen/msgen11b.html">http://www.census.gov/mp/www/pub/gen/msgen11b.html</a></p> <p>U.S. Department of Energy, Energy Information Administration. 2001. Annual energy review 2000. DOE/EIA-0384(2000). Washington, DC 379 p.  <a href="http://www.eia.doe.gov/emeu/aer/pdf/038400.pdf">http://www.eia.doe.gov/emeu/aer/pdf/038400.pdf</a></p> <p>U.S. Department of Energy, Energy Information Administration. 2002. Monthly energy review, January 2002. DOE/EIA-0035(2002/01). 193 p.  <a href="http://www.eia.doe.gov/emeu/mer/">http://www.eia.doe.gov/emeu/mer/</a></p>

<b>Indicator and Title:</b>	<b>Indicator 32</b> – Value of wood and non-wood products production as a percentage of GDP
<b>Indicator Lead:</b>	Ken Skog, USDA Forest Service, wood products Susan J. Alexander, USDA Forest Service, nonwood products
<b>Data Coverage:</b>	Wood products- Nationwide Nonwood products- Nationwide for medicinals, regional for food and forage species, for floral and horticultural species, and for hunting and trapping
<b>Data Frequency:</b>	Annual wood consumption and trade data for wood products. Annual to periodic reporting for non-wood products depending on product and reporting capability.
<b>Data Currency:</b>	Wood products- 1999 Nonwood products- 1992-1998
<b>Data Source:</b>	Wood products- U.S. Department of Commerce, Bureau of the Census reports on wood manufacturing; Nonwood products- Industry trade reports, newsletters, and journal articles. (see references).
<b>Data Reliability:</b>	Data presented on value and value added for products are for industry sectors in total and not just for wood and paper products. Data on value added by forest products industries includes value added in making some nonwood fiber products. Data on value added includes some, but not all, of the value added by forest management activities. Data on value of nonwood forest products are limited to a portion of the product categories, and the portion that is value added is not available. Reporting of employment data and regional contributions for nonwood products is inconsistent
<b>References:</b>	<p><b>Wood products</b></p> <p>U.S. Department of Commerce, Bureau of the Census. 1995a. 1992 Census of manufacturers, industry series: household furniture, industries 2511, 2512, 2524, 2515, 2517, and 2519. MC92-I-25A. Washington, DC. 26 p. + app. (<a href="http://www.census.gov/prod/1/manmin/92mmi/mci25af.pdf">http://www.census.gov/prod/1/manmin/92mmi/mci25af.pdf</a>)</p> <p>U.S. Department of Commerce, Bureau of the Census. 1995b. 1992 Census of manufacturers, industry series: office, public building, and miscellaneous furniture; office and store fixtures, Industries 2521, 2522, 2531, 2541, 2542, 2591, and 2599. MC92-I-25B. Washington, DC. 31 p. + app. (<a href="http://www.census.gov/prod/1/manmin/92mmi/mci25bf.pdf">http://www.census.gov/prod/1/manmin/92mmi/mci25bf.pdf</a>)</p> <p>U.S. Department of Commerce, Bureau of the Census. 1998. 1996 Annual survey of manufacturers - statistics for industry groups and industries. M96 (AS)–1. Washington, DC. 64p. + app. (<a href="http://www.census.gov/prod/3/98pubs/m96-as1.pdf">http://www.census.gov/prod/3/98pubs/m96-as1.pdf</a>)</p> <p>U.S. Department of Commerce, Bureau of the Census. 2002. Statistics of U.S. Businesses 1992, 1997, 1998, 1999. Web site: <a href="http://www.census.gov/csd/susb/susb2.htm#go92">http://www.census.gov/csd/susb/susb2.htm#go92</a> data files: <a href="http://www.census.gov/csd/susb/usalli92.xls">http://www.census.gov/csd/susb/usalli92.xls</a> <a href="http://www.census.gov/csd/susb/usalli97.xls">http://www.census.gov/csd/susb/usalli97.xls</a> <a href="http://www.census.gov/csd/susb/usalli98.xls">http://www.census.gov/csd/susb/usalli98.xls</a> <a href="http://www.census.gov/csd/susb/usalli99.xls">http://www.census.gov/csd/susb/usalli99.xls</a></p> <p>U.S. Department of Commerce, Bureau of Economic Analysis. 2002a. Shipments of Manufacturing Industries by four-digit SIC industry, three-digit</p>

SIC industry group, and two-digit SIC major group. Web site  
(<http://www.bea.doc.gov/bea/dn2/gpo.htm>)

U.S. Department of Commerce, Bureau of Economic Analysis. 2002b. Gross Domestic Product by Industry and the Components of Gross Domestic Income. Current dollar estimates for 1947-2000. Web site  
(<http://www.bea.doc.gov/bea/dn2/gpo.htm>)

### **Non-wood products**

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Brevoort, P. 1998. The booming U.S. botanical market: a new overview. *HerbalGram* 44: 33-44.

Mater, C. 1997. Consumer trends, market opportunities, and new approaches to sustainable development of special forest products. Special forest products: biodiversity meets the marketplace. In: Vance, N.; Thomas, J., eds. Gen Tech. Rep. GTR-WO-63. Washington, DC: U.S. Department of Agriculture, Forest Service: 8-25. (<http://www.fs.fed.us/pnw/pubs/gtr63/gtrwo63a.pdf>)

Schlosser, W.; Blatner, K.; Chapman, R. 1991. Economic and marketing implications of special forest products harvest in the coastal Pacific Northwest. *Western Journal of Applied Forestry*. 6(3): 67-72.

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<b>Indicator and Title:</b>	<b>Indicator 33</b> – Degree of recycling of forest products
<b>Indicator Lead:</b>	Ken Skog, USDA Forest Service
<b>Data Coverage:</b>	Nationwide
<b>Data Frequency:</b>	Annual wood consumption and trade data
<b>Data Currency:</b>	1999, 2000
<b>Data Source:</b>	Data for this indicator are from the USDA Forest Service, Forest Products Laboratory reports on U.S. Timber production, trade, consumption, and price statistics; Forest Products Laboratory report on woody residual recycling; and American Forest and Paper Association reports on paper, paperboard and woodpulp.
<b>Data Reliability:</b>	Data on recovery and reuse of wood from municipal waste and construction waste and demolition are not complete. Estimates are only available on total that is recovered or unavailable. Data on solid wood recycling are only for limited industries such as pallet manufacture. Data on use of yard trimmings, municipal solid waste, construction and demolition waste are not included.
<b>References:</b>	<p>American Forest and Paper Association. 2001. Paper, paperboard and woodpulp, 2001 statistics, data through 2000. Washington, DC. 82 p.</p> <p>Howard, J.L. 2001. U.S. Timber production, trade, consumption, and price statistics, 1965-1999. FPL-RP-595. Madison, WI: U.S. Department of Agriculture, Forest Service, Forest Products Laboratory. 90 p. (<a href="http://www.fpl.fs.fed.us/documnts/FPLrp/fplrp595/fplrp595.htm">http://www.fpl.fs.fed.us/documnts/FPLrp/fplrp595/fplrp595.htm</a>)</p> <p>McKeever, D.B. 1999. How woody residuals are recycled in the United States. Bio Cycle. 40(12): 33-44. (<a href="http://www.fpl.fs.fed.us/documnts/pdf1999/mckee99a.pdf">http://www.fpl.fs.fed.us/documnts/pdf1999/mckee99a.pdf</a>)</p>

<b>Indicator and Title:</b>	<b>Indicator 34</b> – Supply and consumption/use of non-wood products.
<b>Indicator Lead:</b>	Susan Alexander, USDA Forest Service
<b>Data Coverage:</b>	All U.S. forest land
<b>Data Frequency:</b>	Varies, intermittent to annually
<b>Data Currency:</b>	2002
<b>Data Source:</b>	Game animals, fur bearers- State and Federal wildlife agencies. Medicinals, Food and forage species, floral and horticultural species, resins and oils, arts and crafts- market reports, USDC Bureau of the Census export data (US Harmonized Tariff Code System), U.S. Department of Agriculture, Forest Service and U.S. Department of Interior, Bureau of Land Management permit data, local and regional surveys. Secondary wood products: USDA Forest Service and USDI Bureau of Land Management permit data, USDC Bureau of Census data, and USDC Bureau of Economic Analysis data.
<b>Data Reliability:</b>	Varies by product category, no standardized system
<b>References:</b>	Alexander, S. J.; Weigand, J.F.; Blatner, K.A... 2002. U.S. commerce in nontimber forest products. In: Jones, E.T.; McLain, R.J.; Weigand, J.F., Eds. Nontimber forest products in the United States. Lawrence, KS: University Press of Kansas. 424 p.  U.S. Department of Commerce, Bureau of the Census. 2002. Statistics of U.S. businesses 1992, 1997, 1998, 1999. Web site: <a href="http://www.census.gov/">http://www.census.gov/</a>  U.S. Department of Commerce, Bureau of Economic Analysis. 2002. Web site: <a href="http://www.bea.doc.gov/">http://www.bea.doc.gov/</a>

<b>Indicator and Title:</b>	<b>Indicator 35</b> – Area and percent of forest land available for general recreation and tourism, in relation to the total area of forest land.
<b>Indicator Lead:</b>	Ken Cordell, USDA Forest Service
<b>Data Coverage:</b>	Nationwide
<b>Data Frequency:</b>	10-year interval
<b>Data Currency:</b>	1997
<b>Data Source:</b>	The USDA Forest Service, Research and Development, Forest Inventory and Analysis (FIA) program. FIA is mandated under the Forest and Rangeland Renewable Resources Research Act of 1978 (PL 95-307, as amended), which replaced the McSweeney/McNary Act of 1928, directing the Secretary of Agriculture to collect, analyze, and periodically report information about renewable resources of the Nation's forest, range, and related lands. Except for nonindustrial forest land, area and percentage of forest reported for this indicator focuses on public and industrial land “available”, i.e., open to access for recreation uses to some people, exclusively and inclusively, rather than “managed for general recreation”. The second source covering nonindustrial private forest land was the USDA Forest Service Research and Development’s National Survey on Recreation and the Environment (NSRE). In a population-wide survey, land owning respondents were identified and data were collected concerning recreationally available forest area.
<b>Data Reliability:</b>	Management for recreation is a vague term that could refer to levels of management ranging from developed and intensively maintained and patrolled to accessible but with no effort at maintenance or oversight. For the first data source, FIA field surveys are designed to provide reliable forest area data at +/- 3 percent per million acres of forest area and +/-5 percent per billion cubic feet of volume. Historic estimates prior to FIA field inventories have been developed from FIA trend data on forests and U.S. Bureau of the Census data on forest land cleared for farming since 1850. For the second data source, the NSRE, estimates are reliable at +/- 3 to 5 percent, depending on sample size.
<b>References:</b>	<p>Smith, W.B.; Vissage, J.S.; Darr, D.R.; Sheffield, R.M. 2001. Forest Statistics of the United States, 1997. Gen. Tech. Rep. NC-219. St. Paul, MN: U.S. Department of Agriculture; Forest Service. 191 p.</p> <p>FIA statistics, online databases, references, and a map of U.S. forest distributions are available at <a href="http://fia.fs.fed.us">http://fia.fs.fed.us</a>.</p> <p>Documentation can be found at <a href="http://www.srs.fs.fed.us/trends/Indicators/Documentation">www.srs.fs.fed.us/trends/Indicators/Documentation</a> or is available in hard copy by request to <a href="mailto:smou@fs.fed.us">smou@fs.fed.us</a>.</p>

<b>Indicator and Title:</b>	<b>Indicator 36</b> – Number and type of facilities available for general recreation and tourism in relation to population and forest area
<b>Indicator Lead:</b>	Ken Cordell, USDA Forest Service
<b>Data Coverage:</b>	Nationwide
<b>Data Frequency:</b>	10-year interval
<b>Data Currency:</b>	1992-2000.
<b>Data Source:</b>	Forest Service, National Outdoor Recreation Supply Information System (NORSIS). NORSIS is a combination of original survey data and secondary source data. Public agency facilities data are from ongoing inventories maintained by individual agencies, federal and state. State park system data are from the National Association of State Park Directors. Campground data are from Woodalls and Rand McNally directories. Estimates of facilities on private nonindustrial forest lands are from the National Survey on Recreation and the Environment (NSRE), USDA Forest Service, Research and Development. Landowning respondents to the survey were asked to inventory day and overnight facilities.
<b>Data Reliability:</b>	Direct measures and data are largely unavailable for enumerating number and type of facilities for general recreation and tourism in forested settings. Although federal and state agencies maintain data on the sites and facilities they manage, each agency uses different formats and content, and none record whether such facilities are in forest settings. Except for campgrounds, measures less direct than inventory counts of federal and state facilities are used for this report for both levels of government. Inventories of public sector facilities are improving in reliability. Estimates of numbers and types of facilities on nonindustrial private forest lands are derived from nation-wide survey sampling reliable at +/- 3 to 5 percent.
<b>References:</b>	<p>State Parks database compiled from State Departments of Natural Resource web sites, literature and brochures, 1995. USDA Forest Service, Southern Research Station.</p> <p>Forest cover source is: USDA Natural Resources Conservation Service, 1992 National Resources Inventory.</p> <p>Recreational Opportunities on Federal Lands, 2002. <a href="http://www.recreation.gov">www.recreation.gov</a>.</p> <p>Woodall's Campground Directory, 1996.</p> <p>National Survey on Recreation and the Environment (NSRE at <a href="http://www.srs.fs.fed.us/trends">www.srs.fs.fed.us/trends</a>)</p>

<b>Indicator and Title:</b>	<b>Indicator 37</b> – Number of visitor days attributed to recreation and tourism in relation to population and forest area
<b>Indicator Lead:</b>	Ken Cordell, USDA Forest Service
<b>Data Coverage:</b>	Nationwide
<b>Data Frequency:</b>	10-year interval
<b>Data Currency:</b>	1983-2001.
<b>Data Source:</b>	USDA Forest Service, Research and Development, National Survey on Recreation and the Environment (NSRE) and USDA Forest Service, Research and Development, National Visitor Use Monitoring Project, Department of Commerce- Bureau of the Census.
<b>Data Reliability:</b>	All percentages and figures shown are based on NSRE data collected (n=22,847) up to the time this document was written. As data collection proceeds toward the ultimate goal of 75,000 completed interviews, reliability of estimates reported for this indicator will improve. As of this reporting, estimates are reliable at +/- 2 to 3 percent.
<b>References:</b>	National Survey on Recreation and the Environment 2000-2001, Versions 1-11, July 1999 to November 2001. USDA Forest Service, Athens, GA. NSRE at <a href="http://www.srs.fs.fed.us/trends">www.srs.fs.fed.us/trends</a>

<b>Indicator and Title:</b>	<b>Indicator 38</b> – Value of investment, including investment in fast growing, forest health management, planted forests, wood processing, recreation, and tourism.
<b>Indicator Lead:</b>	Dave Wear, USDA Forest Service
<b>Data Coverage:</b>	Nationwide
<b>Data Frequency:</b>	10-year interval.
<b>Data Currency:</b>	1983-2001.
<b>Data Source:</b>	Direct investment in forest establishment and regeneration is measured. In addition, we measure changes in the total stock of forests to estimate net investment. This measures the contribution of direct investment and growth, net of activities that reduce forest stocks such as land use conversions and timber harvests. Investment in forest establishment is tracked and reported by the USDA Forest Service in annual tree planting reports (e.g. Moulton et al. 1995, Moulton 2000). We report the area of tree planting for the United States from 1930 through 1998.
<b>Data Reliability:</b>	Tree planting is only one type of forest management activity. Timber stand improvement activities also are direct investments in forests and are not captured by available data sets. Measures of inventories and of forest capital provide an evaluation of investment relative to timber production alone. Although growing stock also may proxy for growth in the provision of other benefits, this is an incomplete assessment of the accrual of all forest values. Data on new capital investment are most but not all of investment in assets. There is also a smaller amount of investment in used capital equipment. Investments are offset by retirements of equipment. In 1997 there was a change in measurement of capital assets from “Gross book value of depreciable assets” to “Gross book value of total assets”. The latter measure is larger. So, changes in assets after 1997 are not strictly comparable to changes before 1997.
<b>References:</b>	<p>Haynes, R. 2003. An Analysis of the Timber situation in the United States: 1952 to 2050 – a technical document supporting the 2000 USDA Forest Service RPA timber assessment. Gen. Tech. Rep. PNW-560. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 254 p. (<a href="http://www.fs.fed.us/pnw/sev/rpa/">http://www.fs.fed.us/pnw/sev/rpa/</a>)</p> <p>Moulton, R.J.; Lockhart, F.; Snellgrove, J.D. 1995. Tree planting in the United States--1994. Washington, DC: U.S. Department of Agriculture, Forest Service, State and Private Forestry. 18 p.</p> <p>Moulton, R. J. 2000. Tree Planting in the United States--1998. Tree Planters' Notes 49(1): 5-15. <a href="http://www.rtp.srs.fs.fed.us/econ/pubs/misc/rjm001.pdf">http://www.rtp.srs.fs.fed.us/econ/pubs/misc/rjm001.pdf</a></p> <p>Smith, W.B.; Vissage, J.S.; Sheffield, R.M.; Darr, D.R. 2001. Forest resources of the United States, 1997. Gen. Tech. Rep. NC-219. St. Paul, MN: U.S. Department of Agriculture, Forest Service. 109 p. (<a href="http://fia.fs.fed.us/library/final_rpa_tables.pdf">http://fia.fs.fed.us/library/final_rpa_tables.pdf</a>)</p> <p>U.S. Department of Commerce, Bureau of the Census. 1981. 1977 Census of manufacturers, volume II industry statistics, part 1 – major industry groups 20-26. (Industry series covering lumber and wood products, furniture, and paper and allied products). Washington, DC.</p> <p>U.S. Department of Commerce, Bureau of the Census. 1985. 1982 Census of manufacturers. (Industry series covering lumber and wood products, furniture,</p>

and paper and allied products). MC92-I-24A to -24D, MC92-I-25A to 25B, MC92-I-26A to -26C. Washington, DC.

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Wear, D.N. 2002. Timber capital accounts for the United States. Draft manuscript. Research Triangle Park, NC: U.S. Department of Agriculture, Forest Service.

<b>Indicator and Title:</b>	<b>Indicator 39</b> – Level of expenditure on research and development, and education
<b>Indicator Lead:</b>	Ken Skog, USDA Forest Service
<b>Data Coverage:</b>	Nationwide
<b>Data Frequency:</b>	10-year interval
<b>Data Currency:</b>	1978-2001
<b>Data Source:</b>	Forestry research funding at U.S. universities that are partially funded by the Cooperative State Research, Education, and Extension Service by RPA Region, 1995-2000 (thousand 1996 dollars). Funding for USDA Forest Service Research, 1978-2000 (million 1996 dollars). University Extension staff years devoted to forest land related activities, selected years 1989-2004. Extension staff years on forest land related activities per million acres of forest land, selected years, 1989-2004.
<b>Data Reliability:</b>	<p>The data on research and development related to forest land management at universities only includes universities that obtained some funding through the USDA Cooperative State Research, Education, and Extension Service. This includes most of forest land management research funding but not all. The data include industry funding of research at universities, but we do not show data on research funded and conducted by industry.</p> <p>The data on extension education are for efforts focused on forest land management and do not include funding for Extension that may partly include forest land such as outdoor recreation, fish and wildlife or the environment and public policy.</p>
<b>References:</b>	<p>Smith, W.B., J.S. Vissage, R. Sheffield, and D.R. Darr. 2001. Forest resources of the United States, 1997. USDA Forest Service, General Technical Report, NC-219, St. Paul, MN. 109 p. (<a href="http://fia.fs.fed.us/library/final_rpa_tables.pdf">http://fia.fs.fed.us/library/final_rpa_tables.pdf</a>)</p> <p>U.S. Department of Agriculture, Cooperative State Research, Education, and Extension Service. 2001. Renewable resources education – improving the environment and productivity of forests and rangeland through extension education – a report to Congress on the 1996-2000 Renewable Resources Extension Program, PL-95-306, and Renewable Resources Extension Act of 1978. Washington, DC.</p> <p>U.S. Department of Agriculture, Cooperative State Research, Education, and Extension Service. 2002. Personal communication with Eric Norland. Washington, DC.</p> <p>U.S. Department of Agriculture, Forest Service. 2002. Personal communication with the Office of Deputy Chief for Research, Washington, DC.</p>



<b>Indicator and Title:</b>	<b>Indicator 40</b> – Extension and use of new and improved technologies
<b>Indicator Lead:</b>	Ken Skog, USDA Forest Service
<b>Data Coverage:</b>	Nationwide
<b>Data Frequency:</b>	10-year interval
<b>Data Currency:</b>	1996-2000
<b>Data Source:</b>	Forest Service, Forest Products Laboratory
<b>Data Reliability:</b>	<p>Only brief narratives have been provided that serve to indicate the range of technology innovations that are having an effect on forest management. We have made only brief mention of areas of technology change that have extensive and complex impact – particularly the role of electronic media increase demand for some types of paper and paperboard and decreasing demand for other types.</p> <p>The data do not indicate how innovations in wood and paper products may have a wider environmental impact beyond the impact on forest management. That is, the total life-cycle effects in terms of energy costs and emissions of alternate technologies to grow, harvest, process, use, reuse, and dispose of wood and paper.</p>

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<b>Indicator and Title:</b>	<b>Indicator 41</b> – Rates of return on investment.
<b>Indicator Lead:</b>	David N. Wear, USDA Forest Service
<b>Data Coverage:</b>	Nationwide
<b>Data Frequency:</b>	Annual planting data. Five to ten year RPA national assessment data. Annual tree planting reports.
<b>Data Currency:</b>	1997 (inventory), 2001 (timber capital)
<b>Data Source:</b>	Data on valuing forest capital for private forest investment and softwood production in the South were developed by Wear (1993). In other regions, stumpage prices and inventory volumes were used to provide a rough estimate of forest asset value. A measure of the rate of return to forest production was then estimated as the ratio of net revenue to asset value. Price and volume data for each component of the inventory by region and year were taken from Smith et al. (2001) and Haynes (2002, table 15). The quantities of timber products by species group and region for benchmark years were taken from various USDA Forest Service reports (Smith et al. 2001, Powell et al. 1993, Waddell et al. 1989, and USDA Forest Service 1965, 1982).
<b>Data Reliability:</b>	Because these aggregate indices reflect the net results of investment across a variety of forest owners—e.g., public and private, active and passive—they do not provide a means for assessing the comparative attractiveness of investment in the forest products sector versus other sectors of the economy. These measures focus strictly on returns to timber production and so are limited in their scope.
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Wear, D.N. 2002. Timber capital accounts for the United States. Draft manuscript. Research Triangle Park, NC: U.S. Department of Agriculture, Forest Service.

<b>Indicator and Title:</b>	<b>Indicator 42</b> – Area and percent of forest land managed in relation to the total area of forest land to be protected
<b>Indicator Lead:</b>	Ken Cordell, USDA Forest Service
<b>Data Coverage:</b>	Nationwide
<b>Data Frequency:</b>	Ongoing with updating
<b>Data Currency:</b>	2000
<b>Data Source:</b>	USDA Forest Service, Research and Development, National Outdoor Recreation Supply Information System (NORSIS). This database is comprised of inventories of land and water in protected status under jurisdictions of federal and state government agencies. Proportions of these protected areas that are forested are estimated from forest cover overlays maintained by the USDA Forest Service Remote Sensing Research Unit, Southern Research Station, Raleigh, North Carolina. Estimates of nonindustrial forest land in conservation easements are from the National Survey on Recreation and the Environment (NSRE). Landowning respondents were asked to inventory land under conservation easement through state, local government, or through nongovernmental organizations.
<b>Data Reliability:</b>	Agency by agency inventories are increasingly reliable as agencies employ digital data media and automated reporting systems. The NORSIS database is updated frequently as data are available. NSRE estimates of nonindustrial forest land under conservations easements are reliable at +/- 3 - 5 percent.
<b>References:</b>	<p>Cordell, H. Ken, et al. 1999. Outdoor recreation resources. In: Outdoor recreation in American life. Champaign IL: Sagamore Publications. p 39-182. Chap. 3.</p> <p>Protected Areas Data Base, Conservation Biology Institute, Corvallis, OR. (<a href="http://www.consbio.org/cbi/what/pad.htm">www.consbio.org/cbi/what/pad.htm</a>) and the Remote Sensing Research Unit, Southern Research Station, Raleigh, NC</p> <p>IUCN, World Conservation Union. 1994. 1993 United Nations List of National Parks and Protected Areas. Prepared by WCMC and CNPPA. IUCN, Gland, Switzerland and Cambridge, UK. xlvii + 315 pp.</p>

<b>Indicator and Title:</b>	<b>Indicator 43</b> – Non-consumptive forest values
<b>Indicator Lead:</b>	Ken Cordell, USDA Forest Service
<b>Data Coverage:</b>	Nationwide
<b>Data Frequency:</b>	One time with some updating
<b>Data Currency:</b>	2000
<b>Data Source:</b>	Few direct measures of nonconsumptive forest values are available for reporting. Primary data source was survey data gathered through the U. S. National Survey on Recreation and the Environment (NSRE) <a href="http://www.frs.fs.fed.us/trends/Nsre/nsre2.html">www.frs.fs.fed.us/trends/Nsre/nsre2.html</a> .
<b>Data Reliability:</b>	Means of estimates of consumer surplus values per activity day per person are shown, along with ranges of estimates from studies done in the United States between 1967 and 1996. NSRE estimates are reliable at +/- 2 to 3 percent.
<b>References:</b>	<p>Cordell, H.K.; Betz C.J.; Bowker, J.M.; English D.B.K.; Shela, H. M. 1999. Outdoor recreation in American life: a national assessment of demand and supply trends. Champaign, IL: Sagamore Publishing. 449 p.</p> <p>Cordell, H. Ken, Gary T. Green, and Carter J. Betz. [In press] Recreation and the environment as cultural dimensions in contemporary American society. Leisure Sciences.</p> <p>Outdoor Recreation Resources Review Commission. 1962. Outdoor recreation for America. Washington, DC: U.S. Government Printing Office. 246 p.</p> <p>National Survey on Recreation and the Environment, Version 4, February 2000 to July 2000. Athens, GA: U.S. Department of Agriculture, Forest Service.</p> <p>Zhu, Z.; Evans, D. L. 1994. U. S. forest types and predicted percent forest cover from AVHRR data. Photogrammetric Engineering and Remote Sensing. 60: 525-531.</p>

<b>Indicator and Title:</b>	<b>Indicator 44</b> – Direct and indirect employment in the forest sector and the forest sector employment as a proportion of total employment.
<b>Indicator Lead:</b>	Ken Skog, USDA Forest Service
<b>Data Coverage:</b>	Nationwide
<b>Data Frequency:</b>	Periodic to annual.
<b>Data Currency:</b>	1995-2000.
<b>Data Source:</b>	U.S. Department of Commerce, U.S. Department of the Interior, U.S. Department of Agriculture, Forest Service.
<b>Data Reliability:</b>	Employment in wood and paper products industries includes all employment in firms where wood and paper products are their primary products. The level of employment related to nonwood forest products can be inferred to a degree by amounts of production provided by analysis and summaries of USDI Bureau of Land Management permit data, industry surveys, USDA Forest Service Sales Tracking and Reporting System (STARS), Harmonized Tariff Code data, and other data sources and analysis at regional or local levels, but rely heavily on local time-specific estimates and reports. Prominent data gaps include personal use and removals from private lands. Data presented on employees in research and development does not include support staff, which may double to triple the number of employees directly, employed by institutions conducting research.

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<b>Indicator and Title:</b>	<b>Indicator 45</b> – Average wage rates and injury rates in major employment categories within the forest sector
<b>Indicator Lead:</b>	Ken Skog, USDA Forest Service
<b>Data Coverage:</b>	Nationwide
<b>Data Frequency:</b>	Periodic to annual
<b>Data Currency:</b>	1995-2000
<b>Data Source:</b>	U.S. Department of Commerce, U.S. Department of Agriculture, Forest Service, National Association of State Foresters
<b>Data Reliability:</b>	Employment in wood and paper products industries includes all employment in firms where wood and paper products are their primary products. But these firms may produce other products and services also. Studies determining income for those collecting or harvesting nonwood forest products are intermittent and for regional or local areas. Studies assessing injury rates have not been found. Safety might be suggested by looking at safety for similar types of work in the agricultural sector. Data have not been found for wages and injury rates for employment in forest-based recreation and tourism or for education. The wage rates for research and education could be developed with limited additional research. The more detailed research may be needed to identify national or regional wages for forest-based recreation and tourism.

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(<http://www.bea.doc.gov/bea/dn/nipaweb/TableViewFixed.asp?SelectedTable=95&FirstYear=1999&LastYear=2000&Freq=Qtr>)

U.S. Department of Commerce, Bureau of Economic Analysis. 2002b. National income and product accounts tables, table 6.6b. wage and salary accruals per full-time equivalent employee by industry, 1948-1987. Web site

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<http://data.bls.gov/cgi-bin/dsrv?sh> , <http://data.bls.gov/cgi-bin/dsrv?hs> )

<b>Indicator and Title:</b>	<b>Indicator 46</b> – Viability and adaptability to changing economic conditions, of forest dependent communities, including indigenous communities
<b>Indicator Lead:</b>	Richard Haynes, USDA Forest Service
<b>Data Coverage:</b>	Nationwide
<b>Data Frequency:</b>	Intermittent
<b>Data Currency:</b>	1990-200.
<b>Data Source:</b>	U.S. Department of Agriculture, Forest Service, periodicals, journals
<b>Data Reliability:</b>	There are serious data limitations for assessing community viability and adaptability at the national scale. Foremost, there is a lack of systematic community-level databases except in some unique cases (such as the Pacific Northwest) where they have been assembled as part of ecoregion assessments. Even where the data have been assembled, there are severe limitations for measuring certain elements of community viability and adaptability.
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<b>Indicator and Title:</b>	<b>Indicator 47 – Area</b> and per cent of forest land used for subsistence purposes
<b>Indicator Lead:</b>	Marla Emery, USDA Forest Service
<b>Data Coverage:</b>	Nationwide
<b>Data Frequency:</b>	Intermittent
<b>Data Currency:</b>	1990-2000
<b>Data Source:</b>	The Alaska Department of Fish and Game, Division of Subsistence has conducted research and gathered data on subsistence for more than 20 years. These data include quantitative measures of community harvest and use of subsistence resources, harvest volumes, and harvest areas. U.S. federal agencies including the Forest Service, Park Service, and Fish and Wildlife Service collect similar data for lands that they manage in Alaska. Data collection has emphasized use of fish and wildlife. Thus, fewer data are available on the use of plant materials. Qualitative studies and small-scale surveys have documented subsistence uses by communities throughout the lower 48 States. Similar studies have undoubtedly been conducted in Hawaii. However, the authors were not in possession of any at the time of reporting. The Alaska data appear to be the only large-scale quantitative measures of subsistence currently available in the United States.
<b>Data Reliability:</b>	Excellent longitudinal data sets on subsistence use of fish and game exist for Alaska. Less information is available for subsistence use of plant materials in that state. Such data are almost completely lacking outside Alaska. However, small-scale surveys provide localized quantitative measures of participation in subsistence activities, and ethnographic research has yielded rich descriptions of the nature and meaning of these practices for various cultural groups throughout the Nation. Some quantitative data are being collected, but the coverage is inadequate to provide a complete measure of the area and percentage of forests used for subsistence throughout the United States. The Alaska context is legally and demographically unique from that of the rest of the Nation.
<b>References:</b>	<p>Glass, R.J.; Muth, R. M. 1989b. The Changing Role of Subsistence in Rural Alaska. Transactions of the 54<sup>th</sup> North American Wildlife and Natural Resources Conference. Washington, DC: Wildlife Management Institute.</p> <p>Muth, R.M.; Ruppert, D.E.; Glass, R.J. 1987. Subsistence use of fisheries resources in Alaska: implications for Great Lakes fisheries management. Transactions of the American Fisheries Society 116: 510-518.</p> <p>Muth, R.M.; Daigle, J.J.; Zwick, R.R.; Glass, R.J... 1996. Trappers and trapping in advanced industrial society: economic and sociocultural values of furbearer utilization in the Northeastern United States. Sociological Spectrum 16: 421-436.</p> <p>Muth, R.M.; Dick, R.E.; Blanchard, K.A. 2001. Subsistence use of wildlife and native peoples' wildlife issues. In: Decker, D.J.; Brown, T.L.; Siemer, W.F., eds. Human Dimensions of Wildlife Management in North America. Bethesda, MD: The Wildlife Society. p 329-351</p> <p>U.S. Department of the Interior, Bureau of Indian Affairs. 2002. Catalog of forest acres. Lakewood, CO: Bureau of Indian Affairs, Forest Resources Planning.</p> <p>Wolfe, R. 1999. Subsistence: frequently asked questions, vol. 2002. Anchorage, AK: Division of Subsistence, Alaska Department of Fish and Game.</p>

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<b>Indicator and Title:</b>	<b>Indicator 48 – Clarifies</b> property rights, provides for appropriate land tenure arrangements, recognizes customary and traditional rights of indigenous people, and provides means of resolving property disputes by due process
<b>Indicator Lead:</b>	Paul V. Ellefson and Calder Hibbard, University of Minnesota
<b>Data Coverage:</b>	Much of the data involved in the clarification of property rights are found in Judicial case law. This information pertains at the local, state, and federal level. Compilations of federal statutes regarding restrictions on federal lands and usufructory rights has been compiled. Property rights laws in regard to forest land has been compiled at the state level, including statutes, which address nuisance laws, right-to-practice-forestry laws, and those laws restricting local ordinances. Case law also has been summarized as pertaining to indigenous people's property rights and due process. Studies also point to the number of property rights groups and volume of federal property rights legislation.
<b>Data Frequency:</b>	These compilations and studies were not conducted with any measurable frequency. Data collection varied as to need and funding for information collection.
<b>Data Currency:</b>	Late 1980s to mid 1990s
<b>Data Source:</b>	Data from federal reports and compilations of statutes and case law. Data is also found in periodic landowner surveys.
<b>Data Reliability:</b>	The variables or combinations of variables that can be used to describe property rights, land tenure arrangements, and ways of resolving disputes over such arrangements are many. Definition and scoping issues abound. Much information exists regarding property rights and land tenure arrangements as they relate to sustainable forest management in the United States. Unfortunately, a true understanding of these rights and arrangements in the context of forests and forestry is often unclear, primarily because information about them has not been gathered in a comprehensive sense not subject to any methodical analysis
<b>References:</b>	<p>Binkley, C.S.; Raper, C.F.; Washburn, C.L. 1996. Institutional Ownership of U.S. Timberland. <i>Journal of Forestry</i>. 94(9): 21-28.</p> <p>Bromley, D.W. 1991. <i>Environment and economy: property rights and public policy</i>. Cambridge, MA: Basic Blackwell Publishers.</p> <p>Coggins, G.C.; Wilkenson, C.F.; Leshy, J.D. 1993. <i>Federal public land and resources law</i>. Westbury, NY: The Foundation Press.</p> <p>Flick. 1994. Changing times: forest owners and the law. <i>Journal of Forestry</i>. 92(5): 30-33.</p> <p>Frykenberg, R.E. 1977. <i>Land control and social structure in Indian history</i>. Madison, WI: University of Wisconsin Press.</p> <p>Goldstein, J.H.; Watson, W. D. 1997. Property rights, regulatory taking, and compensation: implications for environmental protection. <i>Contemporary Economic Policy</i>. 15(4): 32-65.</p> <p>Lund, H.H. 1995. Property rights legislation in the states: a review. PERC Policy Series, Issue Number PS-1. Bozeman, MT: Political Economy Research Center.</p>

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<b>Indicator and Title:</b>	<b>Indicator 49 – Provides</b> for periodic forest-related planning, assessment, and policy review that recognizes the range of forest values, including coordination with relevant sectors
<b>Indicator Lead:</b>	Paul V. Ellefson, University of Minnesota
<b>Data Coverage:</b>	There are at least 26 federal statutes that require major agency-wide activities involving the preparation of strategic program or land use and management plans for federal agencies. Statewide forest resource planning programs were actively underway in 47 states in 1982. In 1985, 29 states had completed first-generation plans and were in the process of implementing them.
<b>Data Frequency:</b>	Varies by need and funding to conduct studies. Most baseline data was collected from mid 1980s to mid 1990s
<b>Data Currency:</b>	Mid 1980s to mid 1990s
<b>Data Source:</b>	Data provided by federal, state, and local agencies as well as reports summarizing data from these sources
<b>Data Reliability:</b>	There is considerable uncertainty regarding the capacity of governments to carry out planning, assessment, and policy review activities. Over the years, there has been no organization or institution that has been assigned special responsibility to gather and prepare timely reports on the status of these activities. Thus consistency of data across states or regions is often difficult to assess. Additionally, the planning and analysis efforts of private forest landowners (industrial, nonindustrial, Indian, nonprofit) and nonfederal public owners, who control nearly two-thirds of the forest land, have been very much overlooked.
<b>References:</b>	<p>Coggins, G. C.; Wilkenson, C. F.; Leshy, J. D. 1993. Federal public land and resources law. Westbury, NY: The Foundation Press.</p> <p>Council on Environmental Quality. 1980. Environmental quality: 1979. Washington, D.C.</p> <p>Dolgin, E. L.; Guilbert, T.G.P. 1974. Federal environmental law. St. Paul, MN: West Publishing.</p> <p>Ellefson, P.V.; Moulton, R.J.; Kilgore, M.A. 2000. Programs and organizations affecting the use, management, and protection of forests: an assessment of agencies located across the organizational landscape of state governments. St. Paul, MN: Department of Forest Resources, University of Minnesota.</p> <p>Ellefson, P.V. 1985. Forest sector plans: coordination with nonforestry interests and national plans for development. In: Proceedings of Ninth World Forestry Congress (Mexico City, Mexico). Rome, Italy: Department of Forestry, Food and Agriculture Organization, United Nations.</p> <p>Gray, G.J.; Ellefson, P.V. 1987. Statewide forest resource planning programs: an evaluation of program administration and effectiveness. Station Bul. 582-1987. St. Paul, MN: Minnesota Agricultural Experiment Station.</p> <p>Hardt, S.W. 1997. Federal land-use planning and its impact on resource management decisions. In: Public Land Law II. Denver, CO: Rocky Mountain Mineral Law Foundation: 4-1 to 4-55.</p>



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<b>Indicator and Title:</b>	<b>Indicator 50 – Provides</b> opportunities for public participation in public policy and decision making related to forests and public access to information
<b>Indicator Lead:</b>	Paul V. Ellefson and Calder Hibbard, University of Minnesota
<b>Data Coverage:</b>	Data covers federal legislation requiring or facilitating public participation, including laws that govern agency rulemaking, federal permitting, public meetings, public access to information, and planning processes. Numbers of national forest plan appeals are given as a measure of public participation and its effectiveness. Compilations of state laws in regards to open meetings, direct initiatives, and referendum authority are included, as well as numbers of state advisory bodies through which the public may participate.
<b>Data Frequency:</b>	These compilations and studies were not conducted with any measurable frequency. Data collection varied as to need and funding for information collection.
<b>Data Currency:</b>	Mid 1980s to 2001
<b>Data Source:</b>	Data are drawn from various studies and directly from the federal register.
<b>Data Reliability:</b>	There is a relatively small body of empirical research regarding public participation processes, especially in relation to forest and related natural resource issues. In large measure this void stems from problems defining the intent and appropriate scope of public participation and the lack of consistency in measures (standards) for judging the success of public participation processes. Even though many have offered generic criteria to assess public participation processes, the results of research using such criteria often remain unclear and indeterminate. Numerous studies have examined public participation in a case study format, but little compilation of these studies has occurred. Although very limited, research also has been undertaken to connect conflict management and public participation activities, testing the hypothesis that public participation processes provide a venue in which to constructively manage conflict.
<b>References:</b>	<p>Baas, J.M. 1993. Assessing ethnic group participation in federal land management agency public involvement processes. Culture, conflict, and communication in the wildland-urban interface. In: Alan W. E.; Chavez, D.J.; Magill, A.W., eds. Boulder CO: Westview Press.</p> <p>Cortner, H.J. 1995. Legal and institutional considerations in public participation in the United States. In: Proceedings of the international symposium on public participation and environmental conservation. November 7-9, 1994. Tokyo, Japan: Japan Society of Forest Planning Press. Tokyo.</p> <p>Dresang, D.L.; Gosling, J.J. 1999. Politics and policy in American states and communities. 2<sup>nd</sup> edition. Boston, MA: Allyn and Bacon.</p> <p>Ellefson, P.V.; Moulton, R.J.; Kilgore, M.A. 2001. Programs and organizations affecting the use, management, and protection of forests: an assessment of agencies located across organizational landscape of state governments. St. Paul, MN: University Of Minnesota, Department of Forest Resources.</p> <p>Gerlicke, K.L.; Sullivan, J. 1994. Public participation and appeals of forest service plans—an empirical examination. Society and Natural Resources 7(2): 125-135.</p> <p>Gray, G.J.; Ellefson, P.V. 1987. Statewide forest resource planning programs: an evaluation of program administration and effectiveness. Station Bulletin</p>

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Wondolleck, J.M.; Yaffee, S.L. 2000. Making collaboration work: lessons from innovation in natural resource management. Washington DC: Island Press.

<b>Indicator and Title:</b>	<b>Indicator 51 – Encourages</b> best practice codes for forest management
<b>Indicator Lead:</b>	Paul V. Ellefson and Calder M. Hibbard, University of Minnesota
<b>Data Coverage:</b>	The data cover a wide landscape including private initiatives and governmental requirements. Types and numbers of certification efforts, both domestically and internationally, are addressed along with numbers regarding acreage enrolled. A compilation of federal laws with both direct and indirect prescriptions for best practice codes is provided. At the state level, data regarding numbers of programs, including type and focus, are assembled. Numbers of state agencies involved, training programs, and monitoring data are also summarized. Numbers of local ordinances are given.
<b>Data Frequency:</b>	Some of the data have been compiled at fairly regular intervals, though many of the compilations and studies were not conducted with any measurable frequency. Data collection has varied as to the need of information and availability of funding.
<b>Data Currency:</b>	Most data used was collected in the late 1980s and in the 1990s
<b>Data Sources:</b>	Data on best practice codes is drawn from a wide variety of sources, including federal reports, various studies, and private-sector sources.
<b>Data Reliability:</b>	Given the seemingly wide variety and large number of efforts that have been made to compile information about legal and related structures that promote best practice codes, a logical conclusion might be that an ample supply of information has been accumulated and that informed judgments could be made about legal capacities to establish best practice codes and focuses them in positive ways on forest sustainability. This may be true in aggregate, yet such masks the existence of very serious information shortcomings. For example, current information about best practice codes is seldom capable of describing changing legal conditions within which codes are developed and implemented and is neither always comprehensive nor capable of being aggregated and usefully summarized. Available information also often lacks a concerted focus on the effectiveness of current legal structures and the programs they promote.
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<b>Indicator and Title:</b>	<b>Indicator 52 – Provides</b> for the management of forests to conserve special environmental, cultural, social, and/or scientific values
<b>Indicator Lead:</b>	Paul V. Ellefson and Calder Hibbard, University of Minnesota
<b>Data Coverage:</b>	The data can be grouped into information regarding private initiatives and government capacity. The only information regarding private sector capacity is that in which organizations have self identified numbers of acres in some sort of protected status, such as conservation easements. The federal capacity is defined by the number of statutes requiring conservation of some value, amount of federally managed land under conservation or acquired land restriction, and amount of other land in protected status, such as wilderness and research natural areas. The state capacity is addressed by a number of studies identifying conservation programs or types of protection in regards to different mediums, such as the preservation of biological diversity. The amount of land in wilderness areas are also included. Local capacity is examined by using partial compilations of land designations and programs.
<b>Data Frequency:</b>	Most of the compilations and studies cited are not products of any regular assessment. Although some agencies and groups compile some of this information on a regular basis, much is only sought when it is needed and funding is available.
<b>Data Currency:</b>	Late 1980s to 2001
<b>Data Source:</b>	Federal reports, national studies, and private sector information
<b>Data Reliability:</b>	The variables or combination of variables that can be used to describe the legal framework for conserving special values associated with forests are numerous and often conflicting. To some, the task is probably perceived as no more difficult than systematically assembling statutes, administrative rules and legal opinions. Such is certainly important. However, the troubling factor is determining exactly what information to gather, analyze, and present when making such an assemblage. In part, this difficulty arises because of the unclear nature of the concepts associated with this indicator. Even if definition issues are addressed; many concerns remain regarding information adequacy.
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<b>Indicator and Title:</b>	<b>Indicator 53 – Extent</b> to which the institutional framework provides public involvement activities and public education, awareness, and extension programs, and make available forest related information.
<b>Indicator Lead:</b>	Paul V. Ellefson and Calder Hibbard, University of Minnesota
<b>Data Coverage:</b>	The data used to assess this indicator is far ranging. Data regarding the private sector capacity for public education is not available in a comprehensive form but is addressed by numbers of organizations involved in public education activities, periodicals published, and examples of programs and certification efforts. The federal capacity for this indicator is assessed by using statutes authorizing educational programs, examples of programs, staffing and funding levels of extension initiatives, and examples of technical assistance programs. State and local government capacity is addressed by looking at numbers of programs and state environmental education initiatives.
<b>Data Currency:</b>	Late 1980s to late 1990s
<b>Data Source:</b>	Federal reports, national and regional studies, and from the private sector.
<b>Data Reliability:</b>	The diversity in form and function of extension, educational, and technical assistance programs raise many questions about the information required to adequately assess educational conditions considered necessary for forest sustainability and conservation. Educational programs are carried out in many ways by various organizations, which makes it difficult to describe the Nation's capacity to promote principles of forest sustainability via educational activities. Such a context suggests a number of information concerns that need to be addressed. Information about the status and condition of education initiatives, the need for investment in new or existing educational programs, processes by which information is communicated, effectiveness and efficiency of educational investments, knowledge and information networks, regional and national influences on educational initiatives, and regional and international comparisons.
<b>References:</b>	<p>American Forest Foundation. 1993. Environmental education activity guides: pre K8. Washington, DC.</p> <p>Biles, L.E. 1996. Education perspective: nonindustrial private forests. In: Nonindustrial private forests: learning from the past, prospects for the future. Baughman, M.J. ed. St. Paul, MN: Minnesota Extension Service. p 28-33.</p> <p>Biles, L.E. 2001. Cooperative extension service personnel in forest management and wood products: a directory. Washington DC: U.S. Department of Agriculture, Cooperative State Research and Extension Service.</p> <p>Butler, G.S. and J.D. Slack. 1994. U.S. educational policy interest groups: institutional profiles. Greenwood Press. Westport, CT.</p> <p>Ellefson, P.V. and C. Hibbard. 2002. Federal and state roles in implementing policies and programs focused on forest sustainability: an assessment of current and future conditions. St. Paul, MN: University of Minnesota, Department of Forest Resources.</p> <p>Gayle Group. 2002. Encyclopedia of associations: 2001. Detroit, MI: Gayle Group Publishers.</p> <p>Hamilton, W.G.; L.E. Biles, L.E. 1998. Forestry extension in the United States. In: Extension forestry: bridging the gap between research and application.</p>



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<b>Indicator and Title:</b>	<b>Indicator 54 – Extent</b> to which the institutional frameworks undertake and implement periodic forest-related planning, assessment, and policy review, including cross-sectoral planning and coordination
<b>Indicator Lead:</b>	Paul V. Ellefson and Calder Hibbard, University of Minnesota
<b>Data Coverage:</b>	The data covers planning, assessment, and policy and program review activities at the federal, state, and local level. Statutes requiring federal planning activities are compiled and categorized by type of planning, coordination efforts, and updating requirements. Examples of efforts of a number of agencies are addressed, including the Forest Service, the Bureau of Land Management, the National Park Service, the Natural Resource Conservation Service, the Fish and Wildlife Service, and the Environmental Protection Agency. As there are no compilations of information addressing assessment activities, examples illustrate the current capacity. A comprehensive survey of policy and program review activities is also nonexistent, but numbers of policy analysts is used as a measure. At the state level, numbers of agencies and other entities involved in planning and policy review are given. The number of statewide forest planning efforts and types of planning are reviewed. There is very little information in this regard for local initiatives.
<b>Data Frequency:</b>	Most of the data has not been produced at a regular interval. Data collection has varied as to need and availability of funding.
<b>Data Currency:</b>	Early 1980s to present
<b>Data Sources:</b>	Federal reports, legal documents, and studies
<b>Data Reliability:</b>	The variables or combination of variables that can be used to describe planning, assessment and policy and review activities, and the agencies and organizations involved therein, are numerous. To some, the task is probably perceived of as no more difficult than systematically assembling statutes, administrative rules, legal opinions, and the organizational setting. Such is certainly important. However, the problem is determining exactly what information to gather, analyze, and present when making such an assemblage. In part, this difficulty arises because of the unclear nature of definitions used to describe planning, assessment and policy analysis activities and the extent to which they are interconnected. Even if definition issues are addressed, many concerns regarding information adequacy remain.
<b>References:</b>	<p>Coggins, G.C.; Wilkenson, C.F.; Leshy, J.D. 1993. Federal public land and resources law. Westbury, NY: The Foundation Press.</p> <p>Council on Environmental Quality. 1980. Environmental quality: 1979. Washington DC.</p> <p>Dolgin, E.L. and T.G.P. Guilbert. 1974. Federal environmental Law. St. Paul, MN: West Publishing.</p> <p>Ellefson, P.V. 1985. Forest sector plans: coordination with nonforestry interests and national plans for development. In: Proceedings of ninth World Forestry Congress (Mexico City, Mexico). Rome, Italy: Department of Forestry, Food, and Agriculture Organization, United Nations.</p> <p>Ellefson, P.V., R.J. Moulton, and M.A. Kilgore. 2001. Programs and organizations affecting the use, management, and protection of forests: an assessment of agencies located across the organizational landscape of state</p>

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<b>Indicator and Title:</b>	<b>Indicator 55 – Extent</b> to which the institutional framework provides capacity to develop and maintain human resource skills across relevant disciplines
<b>Indicator Lead:</b>	Paul V. Ellefson and Calder Hibbard, University of Minnesota
<b>Data Coverage:</b>	Data cover a number of aspects regarding the indicator. Examples regarding the professional workforce are given as a measure of capacity, including numbers of FTEs and type of work for a number of federal agencies. Number of employees engaged in forestry programs at the state level is given. Though little is known about the magnitude of the workforce in private organizations, a measure of capacity is that collected in a survey on industrial forest professionals. Data were also compiled regarding formal education, continuing education, and certification and licensing. Information is provided describing accreditation of educational institutions, enrollment, faculty, degrees awarded, and placement. Examples of legal requirements for continuing education are addressed with examples of agency and university offerings. As certification and licensing programs most often have educational requirements, numbers of state programs are given as a measure of capacity.
<b>Data Frequency:</b>	Most of the data was not collected at regular intervals, but was collected according to need and funding availability.
<b>Data Currency:</b>	1980 to present
<b>Data Source:</b>	Federal reports, organizational surveys, and studies
<b>Data Reliability:</b>	The Society of American Foresters, Society of Wood Science Technology, and the Food and Agriculture Educational Information System (FAEIS) are major sources of information about professional and related education programs important to forest sustainability. As for information about continuing education programs focused on resource professionals, technicians, and timber harvesters, no known sources of comprehensive information about such programs have been established. Similarly, information about formal and continuing education programs involving other resource fields or professionally forest-related programs also has not been gathered and synthesized in a comprehensive sense. Where such data does exist, the information is not always comprehensive not capable of being aggregated and usefully summarized. Furthermore, the available information often lacks a concerted focus on education as an important element to maintaining human resource skills across disciplines.
<b>References:</b>	<p>Block, N.E. 2000. Credentialing and accreditation programs: taking the forestry profession to the next level. <i>Journal of Forestry</i> 98(4): 18-22.</p> <p>Ellefson, P.V.; F.D. Irving, F.D. 1989. Industrial forester staffing of leading wood-based companies: an examination of forester responsibilities. <i>Journal of Forestry</i> 87(3): 42-44.</p> <p>Ellefson, P.V.; Cheng, A.S.; Moulton, R.J. 1995. Regulation of private forestry practices by state governments. <i>Station Bulletin</i> 605-1995. St. Paul, MN: Minnesota, Agricultural Experiment Station. .</p> <p>National Association of State Foresters. 1998. State forestry statistics: 1998. Washington DC: Available at:  <a href="http://www.stateforesters.org/statistics/FY98_Statistics/cover.htm">http://www.stateforesters.org/statistics/FY98_Statistics/cover.htm</a></p> <p>Society of American Foresters. 2000. Accreditation handbook: standards, procedures, and guidelines for accrediting educational programs in</p>

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<b>Indicator and Title:</b>	<b>Indicator 56 – Extent</b> to which the institutional framework provides for the development and maintenance of efficient physical infrastructure to facilitate the supply of forest products and services and support for forest management.
<b>Indicator Lead:</b>	Paul V. Ellefson and Calder Hibbard, University of Minnesota
<b>Data Coverage:</b>	The data are used to reflect the private, federal, state, and local capacity of this indicator. Although there are few available measures, private investment in infrastructure may be extrapolated by examining capital expenditures of private firms and individuals. Federal, state, and local capacity is addressed by expenditures in public works and capital outlays in the area of natural resources. State capacity is also gauged by the number of executive agencies involved in forest infrastructure investments.
<b>Data Frequency:</b>	Much of the data included is collected regularly by the Bureau of the Census. Some of the data is not collected regularly, only on a need and funding availability basis.
<b>Data Currency:</b>	Early 1990s to present
<b>Data Sources:</b>	Most data are compiled by federal agencies; however, some comes from other sources such as surveys and studies
<b>Data Reliability:</b>	The diversity in form and function of infrastructure raises many questions about information required to adequately assess infrastructure conditions considered necessary to forest sustainability and conservation. In a strategic sense, there are a number of information concerns that need to be addressed. For example, there is a pressing need for information about the status and condition of infrastructure, need for investment in new or existing infrastructure, processes by which infrastructure is provided, effectiveness and efficiency of infrastructure investments, knowledge and information networks, regional and national influences on infrastructure, and regional and international comparisons.
<b>References:</b>	<p>American Forest and Paper Association. 2000. Paper, paperboard and wood pulp statistics 2001. Washington DC.</p> <p>Cordell, H.K. 1999. Framework for assessment of demand and supply trends in outdoor recreation. In: Outdoor recreation in American Life. Champaign, IL: Sagamore Publishing. p 31-38.</p> <p>Betz, C.J. 1998. Outdoor recreation supply in the United States: a description of the resources, data, and other information sources. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station.</p> <p>Betz, C.J.; English, D.B.K.; Cordell, H.K. 1999. Outdoor recreation resources. In: Outdoor recreation in American life. Champaign, IL: Sagamore Publishing. pp 39-182.</p> <p>Lewis, B.J.; Ellefson, P.V.; R.J. Moulton, R.J. 1993. Public infrastructure and rural development in forested areas of the lake states: a review and assessment of information needs. Staff Paper Series No. 90. St. Paul, MN: University of Minnesota, Department of Forest Resources.</p> <p>U.S. Department of Commerce, Bureau of the Census. 2000. Annual survey of state and local government finances. Washington, DC: Department of Commerce.</p> <p>U.S. Census Bureau. 2000. Statistical abstract of the United States.</p>

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<b>Indicator and Title:</b>	<b>Indicator 57 – Extent</b> to which the institutional framework enforces laws, regulations, and guidelines.
<b>Indicator Lead:</b>	Paul V. Ellefson and Calder Hibbard, University of Minnesota
<b>Data Coverage:</b>	The data covers federal, state, and local requirements for enforcement. At the federal level, the capacity is measured or estimated by using numbers of statutes, rules, and executive orders authorizing enforcement activities, court injunctions, numbers of employees involved in enforcement activities, budget requests, and numbers of violations. State capacity is assessed by compiling statutes granting enforcement authority, programs requiring enforcement, numbers of agencies engaged in enforcement activities, number of employees, intensity of enforcement, licensing requirements, and monitoring activities. Little information exists as to enforcement activities at the local level, though a partial assessment of local ordinances is available in assessing local capacity.
<b>Data Frequency:</b>	Some of the data are collected on a regular basis, especially that referring to enforcement activities of specific federal agencies. Other data are collected on a need or fund availability basis.
<b>Data Currency:</b>	Mid 1980s to present
<b>Data Source:</b>	The sources of data are extremely diverse in regards to this indicator. Much of the information comes from various studies, federal reports, and surveys.
<b>Data Reliability:</b>	Information about enforcement of laws, rules, and guidelines that are considered important to forest sustainability have been the focus of attention by many public and private organizations. In 1999, the National Association of State Foresters, sought a better understanding of state forestry agency information concerning enforcement. As best can be identified, no other organization has undertaken efforts to determine the nature and timeliness of information describing enforcement activities in the context of forest resources. Those which have been undertaken are not always comprehensive not capable of being aggregated and usefully summarized. Furthermore, the available information often lacks a concerted focus on the effectiveness of enforcement activities.
<b>References:</b>	<p>Alden, A.; Ellefson, P.V. 1997. Natural resource and environmental litigation in the federal courts: a review of parties, statutes, and circuits involved. Staff Paper Series Number 125. Department of Forest Resources. University Of Minnesota. St. Paul, MN.</p> <p>Coggins and Wilkenson. 1990. Federal public land and resources law. NewYork, NY: Foundation Press.</p> <p>Ellefson, P.V.; Cheng, A.S.; Moulton, R.J. 1995. Regulation of private forestry practices by state governments. Station Bulletin 605-1995. St. Paul, MN: Minnesota Agricultural Experiment Station.</p> <p>Ellefson, P.V.; Kilgore, M.A.; M.J. Phillip, M.J. 2001. Monitoring compliance with BMPs: experience of state governments. Journal of Forestry 99(1): 11-17.</p> <p>Ellefson, P.V.; Moulton, R.J.; Kilgore, M.A. 2001. Programs and organizations affecting the use, management, and protection of forests: an assessment of agencies located across the organizational landscape of state governments. St. Paul, MN: University of Minnesota, Department of Forest Resources.</p> <p>Environmental Law Institute. 1998. Almanac of enforceable state laws to control nonpoint source water pollution. Washington, DC.</p>



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<b>Indicator and Title:</b>	<b>Indicator 58 – Extent</b> to which the economic framework provides for investment and taxation policies and a regulatory environment which recognizes the long-term nature of investments and permit the flow of capital in and out of the forest sector in response to market signals, nonmarket economic valuations, and public policy decisions in order to meet long-term demands for forest products and services.
<b>Indicator Lead:</b>	Michael A. Kilgore and Paul V. Ellefson, University of Minnesota
<b>Data Source:</b>	Data is derived from a number of studies, surveys, and federal reports.
<b>Data Coverage:</b>	The data covers federal and state laws, policies, and programs, which are pertinent to this indicator. At the federal level, income tax provisions, estate tax provisions, and fiscal incentive program appropriations are used as measures of capacity. At the state level, taxation programs and fiscal incentive programs are used as measures of capacity. State taxation programs focus on income, estate, and especially property taxation programs, both in number and type of program and in revenue produced. State fiscal incentive programs are addressed as to the number and type of program along with the number of agencies involved.
<b>Data Frequency:</b>	Some of the data is compiled on a regular on-going basis, but most has been collected only periodically, such as in time of need or availability of funding.
<b>Data Currency:</b>	Early 1980s to present
<b>Data Reliability:</b>	Conditions contributing to the investment climate for forest management (for example tax policy or cost-share programs) have been the subject of analyses and research and have resulted in periodic compilations and large-scale assessments of their condition and status. Unfortunately comprehensive, ongoing assessments of these factors and their collective influence on the investment climate for forest resources management are not occurring. Neglected is the centralized, systematic, and regular collection and analysis (on an ongoing basis) of information about federal and state programs that are designed to encourage long-term investment in forest resource management. Currently, such information (program type, scope, and investment levels) is scattered among a variety of public and private organizations. Information gaps are especially noticeable regarding use and effectiveness of various public policies and programs directed at forest landowners.
<b>References:</b>	<p>Bailey, P.D.; Haney, H.L.; Callihan, D.S.; Greene, J.L. 1999. Income tax considerations for forest landowners in the South: a case study on tax planning. <i>Journal of Forestry</i> 97(4): 10-15.</p> <p>Bullard, S.H.; Straka, T.J. 1988. Structure and funding of state-level cost-share programs. <i>Northern Journal of Applied Forestry</i>. 5: 132-135</p> <p>Deloitte; Touche. 2002. Taxation in North America. Cincinnati, OH: available at :<a href="http://www.dtonline.com/northamr">www.dtonline.com/northamr</a>.</p> <p>Ellefson, P.V.; Cheng, A.S.; Moulton, R.J. 1995. Regulation of private forestry practices by state governments. <i>Station Bulletin</i> 605-1995. St. Paul, MN: Minnesota Agricultural Experiment Station. .</p> <p>Ellefson, P.V.; Moulton, R.J.; Kilgore, M.A. 2001. Programs and organizations affecting the use, management, and protection of forests: an assessment of agencies located across the organizational landscape of state governments. St. Paul, MN: University of Minnesota, Department of Forest Resources.</p>

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Wigley, T.B.; Melchior, M.A. 1987. State wildlife management programs for private lands. *Wildlife Society Bulletin* 15: 580-584.

<b>Indicator and Title:</b>	<b>Indicator 59</b> – Non-discriminatory trade policies for forest products
<b>Indicator Lead:</b>	Denise Ingram, USDA Forest Service
<b>Data Coverage:</b>	There are many executive and legislative branch actions that potentially affect trade. These actions have not been systematically reviewed to determine their effects on forest products trade. No agency currently has this responsibility. This review gives examples of various actions that have been taken and suggests the need for further study.
<b>Data Frequency:</b>	Trade data are published monthly by the Department of Commerce. Analyses of these data are generally related to a specific trade action such as duties on softwood lumber from Canada. There are no known studies of the non-discriminatory aspects of U.S. trade policies affecting forest products.
<b>Data Currency:</b>	The discussion in the report is for the situation as of about 2001.
<b>Data Source:</b>	Trade organization reports, U.S. Department of Commerce.
<b>Data Reliability:</b>	Trade data are generally reliable for timber products. Data for nontimber forest products are not complete and often are reported in obscure categories. The reliability of analyses of these data depends on the authors' care in conducting the analyses.
<b>References:</b>	<p>Barbier, E. B.; Burgess, J.C.; Bishop, J Alyward, B. 1994. The economics of the tropical timber trade. London, UK: Earthscan Publications Ltd.</p> <p>ISO. 2002. Background to the agreement on technical barriers to trade. International Organization for Standardization.</p> <p>U.S. Code. 1993. Forest Resource Conservation and Shortage Act of 1990, 16 U.S.C. ss620-620j, August 20, 1990, as amended 1993. Washington, DC</p> <p>U.S. Department of State. 2002. The language of trade: chronology of major trade developments affecting U.S. trade policy. Washington, DC: <a href="http://usinfo/trade/language/chron.txt">http://usinfo/trade/language/chron.txt</a>.</p>

<b>Indicator and Title:</b>	<b>Indicator 60</b> – Availability and extent of up-to-date data, statistics, and other information important to measuring or describing indicators associated with criteria 1-7
<b>Indicator Lead:</b>	David Darr, USDA Forest Service
<b>Data Coverage:</b>	Nationwide
<b>Data Frequency:</b>	One-time analysis
<b>Data Currency:</b>	2002
<b>Data Source:</b>	Indicator leads. This was an analysis of availability and extent of up-to-date data, statistics, and other information important to measuring or describing indicators associated with criteria 1-7.

<b>Indicator and Title:</b>	<b>Indicator 61</b> – Scope, frequency, and statistical reliability of forest inventories, assessments, monitoring and other relevant information.
<b>Indicator Lead:</b>	W. Brad Smith, USDA Forest Service
<b>Data Coverage:</b>	Nationwide
<b>Data Frequency:</b>	One-time analysis
<b>Data Currency:</b>	2002
<b>Data Source:</b>	Indicator leads. This was an analysis of the scope, frequency, and statistical reliability of forest inventories, assessments, monitoring, and other relevant information. Coverage, frequency, and frequency of data were reported by each indicator lead and summarized for this indicator.

<b>Indicator and Title:</b>	<b>Indicator 62</b> – Compatibility with other countries in measuring, monitoring and reporting on indicators
<b>Indicator Lead:</b>	Rob Hendricks, USDA Forest Service
<b>Data Coverage:</b>	Seven indicators compared for 12 Montreal Process countries [Argentina, Australia, Canada, Chile, China, Japan, Republic of Korea, Mexico, New Zealand, Russia, United States, and Uruguay]
<b>Data Frequency:</b>	One-time study of international data compatibility conducted by Montreal Process Technical Advisory Committee at Portland, Oregon Workshop, August 26-31, 2001.
<b>Data Currency:</b>	Most recent data for each country. U.S. data for 2002
<b>Data Source:</b>	Country data for indicator 1 (extent of forest area), indicator 10 (area for forest available for timber production), indicator 15 ( area of forest damaged by insects, disease, fire, etc), indicator 19 (area and percent of forest managed for protective functions), indicator 26 (total forest biomass and carbon pool), indicator 44 (direct and indirect employment in the forest sector), indicator 61 (scope, frequency, and reliability of forest inventories). U.S. data from 2003 Sustainability Report.
<b>Data Reliability:</b>	Data for the United States is of varying reliability. See each of the selected indicators in this report for indicator reliability. See the Montreal Process web site under references to review the TAC multi-country comparative results for the seven indicators listed above.
<b>References:</b>	<a href="http://www.mpci.org/meetings/meetings_e.html">http://www.mpci.org/meetings/meetings_e.html</a>

<b>Indicator and Title:</b>	<b>Indicator 63</b> – Development of scientific understanding of forest ecosystem characteristics and functions
<b>Indicator Lead:</b>	Dave Darr, USDA Forest Service
<b>Data Coverage:</b>	Nationwide
<b>Data Frequency:</b>	One-time survey
<b>Data Currency:</b>	2001
<b>Data Reliability:</b>	The survey covers USDA Forest Service Research and Development, six companies in forest industry and most universities with Forestry schools. It does not include other public agencies with research, teaching, or extension capacities.
<b>Data Source:</b>	A review of the capacity to conduct and apply research and development aimed at improving forest management and delivery of forest goods and services. A report on file with David Darr, USDA Forest Service, Washington, DC.



**Indicator and Title:** **Indicator 64 – Development** of methodologies to measure and integrate environmental and social costs and benefits into markets and public policies and to reflect forest related depletion or replenishment in national accounting systems.

**Indicator Lead:** Linda Langner, USDA Forest Service

**Data Coverage:** Nationwide

**Data Frequency:** One-time assessment of methods and status of efforts to revise or augment national accounting systems

**Data Currency:** 2002

**Data Source:** Literature that reviews current methodologies relevant to the indicator. The primary source on the status of national accounting efforts was: Nordhaus and Kokkelenberg (1999).

**References:**

Nordhaus, W.D.; Kokkelenberg, E.C., eds. 1999. Nature's numbers: expanding the national economic accounts to include the environment. Washington, DC: National Academy Press.

<b>Indicator and Title:</b>	<b>Indicator 65</b> – New technologies and the capacity to assess socioeconomic consequences
<b>Indicator Lead:</b>	David Darr, USDA Forest Service
<b>Data Coverage:</b>	Anecdotal
<b>Data Frequency:</b>	Data not published for total capacity
<b>Data Currency:</b>	2002
<b>Data Source:</b>	U.S. Department of Agriculture, Forest Service
<b>Data Reliability:</b>	Anecdotal information was used for the summary. Further research is needed to collect more detailed data.
<b>References:</b>	None published

<b>Indicator and Title:</b>	<b>Indicator 66 – Enhancement</b> of ability to predict impacts of human intervention on forests
<b>Indicator Lead:</b>	Dave Darr, USDA Forest Service
<b>Data Coverage:</b>	Nationwide
<b>Data Frequency:</b>	One-time survey
<b>Data Currency:</b>	2001
<b>Data Source:</b>	A review of the capacity to conduct and apply research and development aimed at improving forest management and delivery of forest goods and services. A report on file with David Darr, USDA Forest Service, Washington, DC.
<b>Data Reliability:</b>	The survey covers USDA Forest Service Research and Development, six companies in forest industry and most universities with. Forestry schools. It does not include other public agencies with research, teaching, or extension capacities.
<b>References:</b>	

<b>Indicator and Title:</b>	<b>Indicator 67</b> – Ability to predict impacts on forests of possible climate change
<b>Indicator Lead:</b>	Steve McNulty, North Carolina State University
<b>Data Coverage:</b>	Nationwide
<b>Data Frequency:</b>	Metaanalysis and new model simulations
<b>Data Currency:</b>	2002
<b>Data Source:</b>	A review of the capacity to conduct and apply research and development aimed at better understanding the influence of climate change on forest sustainability and ecosystem function, and an assessment of management coping strategies to reduce negative climate change impacts.
<b>Data Reliability:</b>	The metaanalysis and new model simulations were peer reviewed by over 3,000 scientists, policymakers and land managers for accuracy of data and data interpretation as part of the National Assessment of Climate Change Impacts to U.S. Forests.
<b>References:</b>	<p>Aber J.D.; Neilson, R.; McNulty, S.G.; Lenihan, J.; Bachelet, D.; Drapek, R. 2001. Forest processes and global environmental change: predicting the effects of individual and multiple stressors. <i>BioScience</i> 59: 735-751.</p> <p>Dale V.H., L.A. Joyce, S.G. McNulty, and R.P. Neilson. 2000. The interplay between climate change, forests, and disturbances. <i>science and the total environment</i>. 262: 201-204.</p> <p>FIA statistics, 2002 RPA online data, references, and a map of U.S. forest distributions are available at <a href="http://fia.fs.fed.us">http://fia.fs.fed.us</a>.</p> <p>Joyce L.; Aber, J.; McNulty, S.G.; Dale, V.; Hansen, A.; Irland, L.; Neilson, R.; Skog, K. 2001. Potential consequences of climate variability and change for the forests of the United States. In: <i>Climate Change Impacts on the United States</i>. Cambridge, UK: Cambridge Press. p. 489-523.</p> <p>McNulty S.G.; Aber, J.D. 2001. U.S. national climate change assessment on forest ecosystems: an introduction. <i>BioScience</i> 51: 720-722.</p> <p>Oren R.; Ellsworth, D.S.; Johnsen, K.H.; Liu, K.; Phillips, N.; Ewers, B.E.; Maier, C.; Karina, Schäfer, V.R.; Hendrey, G.; McNulty, S.G.; Katu, G.G. 2001. Soil fertility limits carbon sequestration by forest ecosystems in CO<sub>2</sub>-enriched atmosphere. <i>Nature</i> 411: 469-472.</p>